Smithsonian Institution

Bleker Atlas

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1856
Fishes

CATALOGUE

OF

APODAL FISH,

IN THE COLLECTION OF

THE BRITISH MUSEUM.

BY

DR. KAUP,

PROFESSOR OF NATURAL HISTORY, DARMSTADT.

LONDON:
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1856.

597
Fishes

PREFACE.

The object of the present Catalogue is to give a description of all the genera and species of APODAL FISH known to exist in the different English and continental collections.

For this purpose, the specimens contained in the Museums of Paris, Leyden, Berlin, and Frankfort on the Maine, have, by the kindness of their curators, been brought together, and carefully compared and examined with those in the British Museum and the Museum of the Naval Hospital at Haslar.

The German MS. of Dr. KAUP has been translated, and the printing of the work kindly superintended by Sir JOHN RICHARDSON, K.C.B., M.D., F.R.S., who had, in the Natural History of the Voyage of H.M.S. *Erebus* and *Terror*, previously described and figured many of the Apodals in the British Museum.

During the printing of the work and the engraving of the plates, the genera have been adopted by Sir John Richardson in his article Ichthyology, in the new edition of the Encyclopædia Britannica; and a synopsis of the genera and new species has been published by Dr. Kaup, in German, in the *Archiv. für Naturgeschichte*, xxii. 41, 1856.

JOHN EDWARD GRAY.

December 30, 1856.

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CATALOGUE

OF

FISH.

Order I. APODES.

Malacopterygii Apodes, *Cuvier.*

Fishes of this order have an elongated form, are destitute of ventral fins, and are covered by a thick, slimy skin, for the most part naked, but in some genera enveloping small scales. The skeleton exhibits no developed ribs. Pyloric cæca wanting. The greater number have a swimming bladder, frequently of an uncommon form.

That the numerous species of this order may be duly arranged, the families and sub-families must be divided into many genera.

Section I. *CRYPTOMYCTERES.*

The hinder nostrils situated in a crevice on the border of the lip, or on the inner side thereof.

Family I. OPHISURIDÆ.

Members of this family have a posterior nostril, which is placed in a cleft on the border of the lip, or perforates the inner soft part thereof.

Sub-Family 1. OPHISURINÆ.

These have the tail ending in a conical point, which is naked, and not encompassed by the dorsal or caudal fins.

a. *Teeth disposed in a single row, on all the dentiferous bones.*

Genus 1. LEIURANUS, *Bleeker.*

Diagn. No vomerine teeth.

Descr. The upper jaw is elongated like that of a shark, and the

under one is unusually short and round. The foremost nostril is situated under the projecting snout, and the hinder one in the lip beneath the eye. The eyes are placed nearer to the corner of the mouth than to the tip of the snout. The nasal teeth are disposed in two incomplete rows. The palatine teeth form a semicircle. Pectoral fins very short, scarcely visible. The tail tipped by a thorn-like point.

1. Leiuranus colubrinus.

Muræna colubrina, *Bodd. apud Pall. Beitr.* xi. p. 56, tab. ii. f. 3.
M. annulata, *Thunb. Spic. Ichth.* viii. t. i. f. 1.
Gymnothorax annulatus, *Bl. Schn.* p. 527.
Ophisurus fasciatus, *Lac.* iv. p. 686.
Oph. colubrinus et vimineus, *Rich., Ereb. & Terr.* pp. 100 and 106; *Ichth. of Sulph.* p. 107, pl. 52, f. 16–20; *Report*, p. 314.
Leiuranus Lacepedii et Stethopterus vimineus, *Bleeker, Murænoiden*, p. 24.
Ophisurus multizonus, *Cuv.* (Paris. Mus.).

Having from 28 to 33 black cross-bars, which do not embrace the white belly. Head and tail tipped with white. In the Parisian collection there is a black variety from Java.

China, Mauritius, Malayan Archipelago.

b. *Vomerine teeth uniserial, sub-biserial, or biserial. Palatine and mandibular teeth uniserial.*

Genus 2. CENTUROPHIS, *Kaup.*

A transparent, thorn-like, caudal tip. Vomerine teeth standing in a single series, or sometimes partially or wholly biserial. The nasal teeth reaching beyond the under jaw.

2. Centurophis spadiceus, fig. 1.

Ophisurus spadiceus, *Rich., Ereb. & Terr.* p. 103; *Report*, p. 313.

A moderately-elongated shape, with an outstretched, more oval head. Eyes situated nearer to the angle of the mouth than to the end of the snout. Pectoral fins as long as the jaws.

Five or six teeth implanted in the projecting nasal bone, in an arch turned backwards. 17–22 short palatine teeth, bent inwards, and commencing in the vicinity of the first vomerine teeth. 17 vomerine teeth. 19 mandibular teeth, of which the foremost are the longest. In a specimen in the Leyden Museum, I noticed the vomerine teeth to be in two irregular rows; and in another, these teeth to be in two rows at their commencement only.

In the example, whose head I have sketched, the general tint is

flesh-coloured, with 10 bluish-black pores on the snout and about the eyes; 5 in an arch on the occiput; 7 on the under jaw; and about 150 on the sunken lateral line. On the edge of the upper lip, there are two tags of skin. The dorsal fin extends forwards as far as the point of the pectoral, and is brownish, with longitudinal black stripes, grizzled with white. The anal fin is similarly marked.

Total length, 28 in. Length of tail, 15·4 in.; of head, 1·3 in. Length of snout to the corner of the mouth, 0·71 in. Length from tip of snout to the gill-opening, 2·52 in. The pectoral, which has 12 rays, measures 0·75 in. The dorsal and anal fins are respectively 0·39 in. high.

Canton (Brit. Mus.), Madagascar, and Vanikoro (Quoy and Gaim. Par. Mus.).

3. Centrurophis remicaudus.

Ophisurus remicaudus, *Par. Mus.*

On the forepart of the head, there are small, deep scars. No skin-tags on the edge of the upper lip. Eyes large, near the angle of the mouth. The dorsal fin commences at a moderate distance from the tip of the pectoral. Dorsal and anal fins defined by whitish and brownish spots on their roots. The colour of the body down to the belly, is brownish, with numerous dark specks. The under parts are more dotted with gray. Pectoral fin whitish, with brownish dots. On the occiput, there is a transverse line of small whitish warts.

Length up to the angle of the mouth, 0·59 in. Length of pectoral fin, 0·75 in. Length down to the gill-opening, 1·62 in. Down to the anus, 8·27 in. Length of the tail, 9·70 in. Diameter of the eye, 0·20 in.

In the Paris Museum, there are two specimens collected by Bibron, in Sicily.

4. Centrurophis bangko.

Ophisurus bangko, *Bleeker, Add. zu Muræn.*

Having 5 nasal teeth, whereof 4 stand in two rows; 28 teeth on the palatine bone; 34 on the vomer, disposed in two ranks. On the mandible, 36 teeth.

The length of the head is contained nine or ten times in the entire length of the fish, or three times and a half in the length to the anus;* while the length of the snout is at least twice that of the diameter of the eye. On the upper lip, there is a papilla, and the lateral line is sunken. Dorsal fin commencing one-third or one-fourth of the length of the head beyond the gill-opening; it is

* Drs. Bleeker and Cantor measure the head from the tip of the snout to the gill-opening.

notched posteriorly. The rounded pectoral is contained twice and one-third in the length of the head. Upper surface orange-green, under one orange-yellow. Dorsal yellowish-green, with a red border. Pectoral fin, orange; anal, orange-yellow.

Rays: Br. 35; D. 260; A. 175.

Length, 13 to 14 inches.

Java.

5. CENTRUROPHIS GRANDOCULIS, fig. 2.

Ophisurus grandoculis, *Cantor*, *Mal. Fish.* p. 1306, pl. v. f. 3.

Medial line of the tip of the upper jaw (nasal part) armed by a double row of close subulate teeth; in the young, each row contains 3 or 4, but half of them vanish with age, and those that remain become stronger and blunter. At a short distance behind these, the double series of vomerine teeth commence, the anterior ones being the longest, and becoming subulate with age. The posterior ones are much smaller. The palatine teeth begin on a line with the front vomerine teeth, and close to them, receding from them posteriorly. They are small and pointed, or subulate. The subulate mandibular teeth stand also in a single series, and diminish in size as they recede from the toothless symphysis.

On the upper lip, there are two papillæ or cutaneous tags. Eye comparatively large, and having a longitudinal diameter varying from $\frac{1}{11}$th to $\frac{1}{15}$th of the length of the head. The eye occupies nearly the whole space between the lip and the profile, and two of its diameters are contained between it and the tip of the snout; while the distance from the latter to the angle of the mouth is comprehended three times and a half in the length of the head. The dorsal commences above the posterior third of the elongated pectoral, and the anus is placed a little before the third fifth of the entire length of the fish. The pectorals measure one-third of the length of the head. (*Cantor.*)

Penang.

6. CENTRUROPHIS BRASILIENSIS.

Anguilla brasiliensis, *Par. Mus.*

Resembling *C. remicaudus;* but its head is more elongated, and the deep scars, which distinguish *remicaudus*, are wanting. A shorter distance exists between the snout and the gill-opening, as well as from the gill-opening to the beginning of the dorsal. Colour, yellowish-brown, with black dots.

Entire length, 16·15 in., whereof the tail measures 9·06 in.; the gape, or distance from the tip of the snout to the angle of the mouth, 0·47 in.; from the same extremity to the gill-opening, 1·34 in.; from the snout to the dorsal, 2·92 in. Length of the pectoral, 0·32 in.

Rio Janeiro (Quoy and Gaimard, Par. Mus.).

7. Centrurophis macrochir.

Ophisurus macrochir, *Bleeker*, *Muræn.* p. 26.

According to the description of this species, it approaches the group of *Centrurophis;* but seems to be kept apart by the number of its teeth, viz., on the palatal bone 18, with a solitary nasal tooth.* In my genus *Callechelys* also, there is only one tooth on the nasal bone; but this genus has no pectoral fin, and *macrochir* cannot, therefore, be mistaken for a species of that group. Vomerine teeth 36, most of which stand in two ranks, though the posterior ones run into a single row. On each half of the mandible, there are 24 teeth. All the teeth are equally large and pointed. The pectoral fin measures one-third of the length of the head, and the dorsal begins half the length of the head behind the gill-opening. The specimen described by Dr. Bleeker was mutilated of the tail. Its length down to the anus was 5·7 in. It is seemingly the type of a proper group.

Java.

Genus 3. POECILOCEPHALUS, *Kaup.*

Nasal teeth not extending before the lower jaw, 3 in number, the 2 anterior ones smaller, and standing transversely side by side. Palatine teeth 11, arranged in a curve which commences at the mesial line. Vomerine teeth, 11. Mandibular teeth, 18–19. All the teeth pointed, short, curved backwards, and of the same size. Head considerably rounded. Upper lip destitute of cuticular tags. Dorsal beginning opposite to the pectorals, which are very short.

8. Poecilocephalus Bonaparti, fig. 3.

Head, viz. round the eyes, ornamented by an irregular network of black lines; on the occiput, a light, gray band, grizzled with black. Irregular yellowish marks, bordered with black, encompass the throat. Eighteen black bars cross the body, from the occiput onwards; and there are some black spots on the belly. There are also black spots on the dorsal fin in the vicinity of the black body-bands. On the anal, there are merely traces of spots. Length 24 in., whereof the tail measures 10·25 in. From the tip of the snout to the gill-opening, 1·97 in. Length of the pectoral, 0·24 in.

I received this handsome eel from Prince Charles Lucien Bonaparte, the author of the *Fauna Italica*, and of the *Catalogo Methodico.*

Amboina (Quoy and Gaimard).

* Perhaps the four posterior nasal teeth, which normally stand in two rows, are broken away, and only the front pairless one remains.

c. *Two rows of teeth on the nasal bone and tip of the mandible.*

Genus 4. MICRODONOPHIS, *Kaup.*

Teeth very small and sharp pointed. All the fins greatly developed.

9. Microdonophis altipinnis, fig. 4.

The rich collection at Leyden possesses an example of this species from Macassar. It is a female, and contains many thousands of eggs. A second specimen, existing in the Paris Museum, is also a female, whose ovisac is an inch and a half long, and extends into a cavity in the tail. The head is long, and the mouth wide. There is a small cuticular flap before the hinder nostril. In the palatine bones, there are 38 teeth, and in the mandible 43. Many teeth exist on the vomer, of which the posterior ones are too small to be counted. Upper surface black, under one yellow. Dark borders to the dorsal and anal fins. Pectorals black, and containing 16 rays. There are also black specks round the pores of the mandible. Total length, 36·64 in., of which the tail measures 21·67 in.

d. *Biserial teeth on the tip of the mandible only.*

Genus 5. COECILOPHIS, *Kaup.*

Pectoral fins developed longer than the jaws. Anterior nostril opening by a short tube; posterior one furnished with a short, marginal, cuticular tag. Dorsal fin commencing behind the tip of the pectoral.

10. Coecilophis compar.

Ophisurus compar, *Rich., Ereb. & Terr.* p. 105.

Palatine teeth conical, pointed, closely arranged, and of equal height; 26 on each limb of the mandible. Colour, uniform brown, with darker, bordered pectorals. Length, 19·8 in.; tip of the anus, 7·5 in.; to the gill-opening, 2 in.

Sumatra (British Museum).

c. *Palatine teeth two ranked; a single row only on the vomer and mandible.*

Genus 6. OPHISURUS, *Lac., Cuv. (part.)*

Having a small head, and a greatly-elongated, slender snout, which surpasses the mandible in length. Gullet very wide. Eyes nearer to the corner of the mouth. Foremost nostril midway

between the eye and the tip of the snout inconspicuous, without a tube; and the hinder one more on the outer side of the thin lip. The elongated pectoral is about half as long as the jaws.

On the nasal bone, there are 5 marginal teeth, and 9 longer ones on the mesial line; 13 short, pointed ones on the vomer; 60 palatine ones, anteriorly ranged in a single row, but from under the eye two-rowed; they commence at the 6th medial nasal tooth.

11. Ophisurus serpens.

Ophisurus serpens, *Lac.*, *Cuv.*, *Rich.*, *Ereb. & Terr.* p. 106.

The border of the jaw is straight, being curved at the tip of the snout only. Colour above brown, beneath silvery white. Four pairs of pores on the snout; one in the middle of the snout; 2 behind the eyes; 3 behind the mandible; 3 under the eyes; and 5 or 6 pairs on the mandible itself. There are also 3 pores on the occiput, with which the beginning of the lateral line is connected.

This species attains the length of 5 or 6 feet. The British Museum obtained its specimens from Naples; the Leyden Museum theirs from the Cape of Good Hope and Japan. Dr. Bleeker names the Japanese fish *Oph. macrorhynchus;* but as I have not examined the *Oph. serpens* of the *Fauna Japonica,* I can offer no opinion thereon. The *Ophisure long-museau* of Quoy and Gaimard, *Voy. du Freye,* pl. 51, f. 1, is based upon a mutilated specimen of *Muræsox bagio* (*Conger bagio*), and has no relation to *Ophisurus serpens.*

Genus 7. HERPETOICHTHYS, *Kaup.*

Jaws nearly equally long. Snout short. Gullet wide. Eyes near the end of the snout. Head depressed, so that the eyes are nearer the upper surface than they are distant from each other laterally. Anterior tubular nostril at the extremity of the snout, and the hinder one at the commencement of the outer row of palatine teeth. Between the two, on the border of the upper lip, there is a small cutaneous tag. Pectoral fins moderately short. Six or seven nasal teeth, and from 9 to 13 vomerine ones.

12. Herpetoichthys ornatissimus, fig. 5.

Nasal teeth 6; 3 of them on the mesial line, and the foremost two of these standing abreast. Vomerine teeth 9, standing irregularly to the right and left. Exterior palatine teeth 16, inner row 20. Mandibular teeth 24. Pectoral fin supported by 16 rays. Irregular dark spots on the head. On the occiput, there is a transverse line of white spots, and two longitudinal ones; while between the eyes there are curved whitish lines. Along the lateral line there are 16 or 17 large, round, black spots, which are parted by another band of spots of different sizes. The dorsal fin, which begins 0·59 in.

behind the tip of the pectoral, is not much developed, and has black marginal spots and stripes.

Total length, 20·88 in. Length of tail, 9·16 in. Length from the tip of the snout to the gill-openings, 2·56 in. Length of the pectoral, 0·63 in.

Malabar (found by M. Dussumier).

13. Herpetoichthys regius.

Ophisurus regius, *Shaw, Rich., Ereb. & Terr.* p. 106.

? An Ophisurus ophis, *auctorum?*

Body thickish for a fish of this family, rounded throughout, and tapering towards the end of the tail. The pectoral, having 15 rays, is not quite as long as the gape; the dorsal commences half an inch beyond the tip of the pectoral. There are 23 large, pale brown spots or bars on the lateral line; dots and lines of the ground colour traverse the spots, and the whole space, from the summit of the back to some way below the lateral line, is marbled by small, round, pale brown spots, which occupy as much space as the ground colour. The specimen in the British Museum has been immersed in spirits many years, and its tints and markings have doubtless become much impaired. The tail is a little shorter than the body.

Seven nasal teeth are ranged round the terminal border of the rather obtuse snout; and on its mesial line posteriorly, there is a double row of 6 teeth, set alternately, 3 in each row, as in *Muræna*. These are succeeded by a single row of vomerine teeth, which, as well as the nasal teeth, are subulate, acute, and recurved. The palatine teeth are biserial, more slender, all pretty long, and acutely subulate; the outer row is inclined backwards, and the inner row, which is rather taller, is curved towards the mesial line, and is preceded by a single row of 4 teeth, by which the row is connected with the mesial nasal row. Mandibular teeth uniserial, curved backwards and inwards. (*Richardson.*)

Origin unknown.

14. Herpetoichthys sulcatus, fig. 6.

(*Figure.*)

Obscure stripes and points extend over the entire skin; but on the head and throat they are clear and distinct. The pectoral is twice as long as the diameter of the large eyes; and its tip reaches past the commencement of the greatly-developed dorsal. Head bright brown, varied with black; and black longitudinal stripes exist on the edges and middle of the whitish pectorals. The dorsal, which is also whitish, has likewise a black border; but the anal fin, which has a more yellow tint, has its markings more in the middle. On the back, down to the tail, there are 19 large spots, between which, near to the edge of the back, there is a row of smaller marks.

Along the white belly, there are two rows, together with still smaller round spots, irregularly scattered.

Seven teeth on the nasal bone, whereof the foremost 3 are small, the hinder ones large and hatchet-shaped; three stand on the mesial line. Vomerine teeth, 12. Outer row of palatine teeth, 14, inner row, 15, and going further forwards than the outer row. Mandibular teeth, 18.

Total length, 32 in., whereof the tail measures 19 in.

Genus 8. BRACHYSOMOPHIS, *Kaup.*

Eyes placed over the anterior fifth part of the gape. Foremost nostril tube uncommonly short; the hinder one situated in a cleft of the inner surface of the lip, under the eye. Gill-openings very large, and approaching near to one another. Pectoral fin small in proportion to the length of the face. Borders of the lips warty.

15. Brachysomophis horridus, fig. 6.

Nasal teeth, 5; 3 teeth on the mesial line, followed by vomerine ones in the same row. Palatine teeth numbering 27 in the outer row, and 13 longer ones in the inner row. Each limb of the mandible is armed by 12 long teeth, which partly fall out in old individuals.

Upper surface black, under one whitish. The distinctly outstanding dorsal is yellowish, and marbled by brownish points and stripes. Anal fin yellowish. Pectoral dotted.

A young example in the Leyden Museum has a cross occipital bar, composed of 5 black spots, and black spots extending along the lateral line, down almost to the end of the tail. In the Paris Museum, a larger individual exhibits whiter cross lines anteriorly, a wavy, white, cross line, as well as a longitudinal white one, on the occiput, and traces of 5 white specks on the mandible.

The Paris specimen was obtained by Lesson and Gaimard at Otaheite. The specimens in the British Museum were sent thither from the Zoological Society, but without any indication of their origin.

Genus 9. ELAPSOPIS, *Kaup.*

Gape short; snout elongated, obtuse, extending beyond the mandible. Nostril tube short, wider at its extremity than at its commencement. Eye approximating to the gape. Pectoral very small; but sufficiently visible. Body and tail equal in length. Nasal disk armed by 9 slender reflex teeth, 4 in each row, with the odd one in front. Vomerine teeth irregularly uniserial. Palatine teeth

uniserial posteriorly, but standing alternately a little to the right and left; anteriorly, biserial and subtriserial. All the teeth small, and differing very little from each other in size.

16. ELAPSOPSIS VERSICOLOR.

Ophisurus versicolor, *Rich., Ereb. & Terr.* p. 103.

When the mouth is closed, the 9 teeth of the nasal disk overreach the point of the mandible. Body varied by 27 brown rings, considerably wider than the pale interspaces. The low dorsal begins immediately behind the gill-opening. A white spot is placed on the forehead, and the tip of the snout and the end of the tail also are white. This species approaches to *fasciatus* and *colubrinus*. (*Richardson.*)

Length, 20·8 in. From tip of snout to anus, 10·1 in.

Moluccas. In the French and British Museums.

f. *Two rows of palatine and mandibular teeth; one row of vomerine teeth.*

GENUS 10. MYSTRIOPHIS, *Kaup.*

End of the snout dilated to a spoon shape. Foremost nostril tube rudimentary, and placed in the middle of the rostral dilatation. Eyes over the middle of the length of the gape, and, owing to the depression of the head, they are directed somewhat more upwards than laterally. Gill-openings large, and near one another.

17. MYSTRIOPHIS ROSTELLATUS.

Ophisurus rostellatus, *Rich., Ereb. & Terr.* p. 105.

The colour of this large species is hazel-brown, with black longitudinal stripes, and finely spotted ones near the head.

Nasal disk bordered anteriorly by 5 small, acutely subulate teeth, with a stout and very acute tooth implanted in the mesial line, a little further back, and having, in front of it, two small subulate ones. The *vomerine teeth are uniserial*; 2 long, subulate teeth, like the mesial vomerine one, standing at the commencement of the row, with a small interval between them, and followed by 7 closer-set, recurved, subulate teeth. *Palatine teeth biserial*: the outer row consisting of about 18 widely-set, subulate ones, which are tallest near the middle of the gape, and become shorter and stand closer towards the angle of the mouth; while the inner row is formed of 28 more slender and very acute teeth that are much inclined towards the mesial line, as well as somewhat backwards. This row goes forwards to the nasal disk, but does not extend so far backwards as the outer row. *Mandibular teeth biserial*: the

outer row more widely set, larger, and reaching from the symphysis to the angle of the mouth; the inner row resembling the interior palatine one; but confined to the fore-quarter of the mandible, and terminating opposite to the commencement of the outer palatine row. The jaws are narrow, and are capable of lateral expansion, like those of *O. intertinctus*, and, though in a less degree, like those of *O. regius*. (*Richardson.*)

Senegal. A specimen in the Paris Museum has a length of 43 in. The British Museum possesses one, which was presented by Lord Derby, having been obtained on the coast of Africa by one of his collectors.

18? Mystriophis porphyrus.

Ophisurus porphyrus, *Temm. and Schl. F. Jap.* 265, *Piscest.* 116, E. 1.

Red-brown, copper coloured above, whitish beneath, larger fins, blackish edged.

Japan. Museum, Leyden, a single specimen 3 ft. 6 in. long.

Genus 11. MURÆNOPSIS, *Lesueur.*

Head oval; snout not much elongated. Hinder nostril rather on the outer side of the thin lip. Pectoral fins as long, or longer than the large gape, which has a straight commissure. All the teeth of equal length.

19. Murænopsis ocellata.

Ophisurus ocellatus, *Rich., Ereb. & Terr.* p. 104.
Murænopsis ocellata, *Lesueur, Journ. Ac. Sc. of Phil.* v. pl. 4, f. 3.
Ophisurus remiger, *D'Orbign., Voy. dans la Mer d'Am.* pl. xij. f. 2.

Ground colour yellowish-brown, with a darker, spotted head. A fine, white, porous line intersects the occiput, makes a sudden rectangular flexure forwards over the temples, and runs down to the corner of the mouth. Belly whitish. There are from 19 to 21 milk-white spots on the lateral line, of the size of peas. Two narrow marks are placed near the occiput, and a row of white spots extends to the pectoral. A pale brown longitudinal stripe runs near to the anal fin, and a white, dotted, horse-shoe-shaped mark occurs between the eyes. The tail is a little longer than the body, and near its end the dorsal and anal fins become higher. The dorsal has a black border. In an aged specimen (*O. remiger*), the lateral white spots are almost obliterated, traces only of them remaining.

Mexico and South America. British and Paris Museums.

Length, 14 in. Length up to anus, 6·3 in. From tip of snout to gill-opening, 1·58 in. Length of the gape, 0·59 in.

20. Murænopsis dicellurus.

Ophisurus dicellurus, *Rich.*, *Voy. of Sulph.* p. 106, pl. 48, f. 2, 3, 4; *Report*, 1843, p. 312, *Voy. Ereb. & Terr.* p. 105.

Still shorter than preceding. Fourteen rays in the pectoral fin. Commencement of the dorsal opposite to the tip of the pectoral. Throughout, down to the tail, the height of the dorsal is the same; but there, in common with the anal, it first becomes lower, and then wider again, so that the two fins form an ovate lobe, which rounds off, at the extremity of the tail, more suddenly than it rises. The last rays of both fins are very short, and approach as near as possible to the extreme point of the tail, without absolutely going round it. The specimen is bleached by maceration in spirits.

Length, 9·85 in. From tip of snout to the anus, 0·39 in. To the gill-opening, 1·35 in. (*Richardson.*)

China. Estuary of the Yantze-Keang. Brit. Mus.

21. Murænopsis triserialis.

The upper jaw is longer than the mandible, the latter being overreached by the nasal teeth. Anterior nostril tube broad, pretty long, and hanging down with a filament on its inner side. Posterior nostril situated on the margin of the lip, and covered by a broad cutaneous tag. Eye large, and placed a little posterior to the middle of the long gape. Pectoral fin pretty well developed, and only a little shorter than the gape.

This is an elongated species, with a tail longer than the body. The dorsal begins opposite to the tip of the pectoral, and the anal fin becomes, near its end, thicker and higher than elsewhere.

Seven nasal teeth, 2 in front, and 4 on the mesial line. Nine vomerine teeth. Eighteen palatine teeth in the outer row; 10 in the inner row. Outer row of mandibular teeth, 19; inner row composed of 23 shorter ones.

Ground colour of the head and throat brownish, thickly marked with round black spots. Margins of the fins blackish. Two rows of large, round spots, extending along the dorsal fin and lateral line, and a third row, going as far as the anus. Belly silvery, finely dotted, and streaked with brown.

Length of the body, 16·34 in.; of the tail, 19·75 in. Length of the gape, 1·69 in.; of the pectoral, 1·2 in.

Pacific (discovered by Dr. Goodridge, on the voyage of the *Herald*. Brit. Mus.)

g. *The teeth biserial on all the dentiferous bones except the nasal one.*

Genus 12. ECHIOPSIS, *Kaup.*

Characterised by a short face, high-placed eyes, short anterior nostril-tube, and deeply-divided jaws. Pectoral moderately short, being half the length of the gape. Nasal teeth 7, of which the three middle ones are the longest. Three teeth on the mesial line, which are the longest of all. Two rows, each of 15 teeth, stand on the vomer, the rows ending together. Two rows also of palatine teeth, the smallest teeth being in the inner row; there are 18 teeth in the outer row, 3 or 4 of which, situated under the eye, are longer than the rest. Two rows likewise on the mandible, the outer row being the tallest.

22. Echiopsis intertinctus.

Ophisurus intertinctus, *Rich., Ereb. & Terr.* p. 102.
Ophisurus maculatus, *Paris Museum.*

Dorsal commencing the length of the pectoral, behind the tip of that fin. Colour of the head grey, nearly uniform, with very fine black points. On the body, the number of round, black dots is considerably greater, and disposed in three or four rows. Long spots exist on the margin of the dorsal; and the anal is bordered throughout with black. Sir John Richardson describes the young as being dotted on the head, and marked on the body by from 17 to 19 large, round spots, below which there is a series ranged alternately. On the first view no one would believe, from the markings, that the young and old were the same species.

An example in the French Museum, obtained at Martinique, reaches the length of 28 in., of which the tail forms 15·36 in.

Genus 13. SCYTALOPHIS, fig. 7.

Teeth divergent, all nearly of the same size. Pectoral pretty well developed.

23. Scytalophis magnioculis, fig. 8.

Ophisurus brasiliensis, *Par. Mus.*

Eye twice as large as that of the species which immediately follows (*parilis*). Snout more acute, and the barbels of the anterior tubular nostril shorter. Colour, blackish; beneath greyish-black, and dotted. Dorsal and anal fins yellowish-brown, dotted and bordered with black. Whole length, 25·2 in. Length of tail, 17·23

in. Length from the tip of the snout to the eye, 0·43 in. From the tip of the snout to the gill-opening, 3·07 in. Length of the pectoral, 0·98 in. Length of the gape, 0·98 in.

St. Croix and Brazils (Leyden and Paris Museums).

24. Scytalophis parilis, fig. 8.

Ophisurus parilis, *Rich., Ereb. & Terr.* p. 105.

This species is readily distinguishable by the barbel of the anterior tubular nostril. Dorsal fin bordered with black.

Length, 18·91 in. From snout to anus, 6·30 in. From tip of snout to gill-opening, 2·05 in. From the same to angle of mouth, 0·79 in. Length of pectoral, 0·91 in.

Brazils, Surinam, West Indies (in the British, French, and Dutch collections).

h. *All the teeth pointed, standing in two rows, on the palatine, vomer, and mandible.*

Genus 14. LEPTORHINOPHIS, *Kaup.*

Snout pointed. Tubes of the anterior nostril short, hanging downwards. Posterior nostrils piercing the margin of the lips before the eyes. Eyes situated over the middle of the gape. Pectorals developed. Anal and dorsal fins becoming higher just before terminating.

25. Leptorhinophis Gomesii.

Ophisurus Gomesii, *Castelnau*, pl. 44, f. 2, p. 43.

Nasal teeth, 5; the solitary one in front. Palatine teeth, 16 in the exterior row, 23 in the inner row. Vomerine teeth, 42, very irregularly disposed. Mandibular teeth, 25 in the outer row, and 18 in the inner one.

Colour, green, with a great number of dark points; the dorsal aspect dark, the ventral one lighter. Horizontal fins, having darker borders. Dotted longitudinal lines running from the chin over the throat.

Length, 18·1 in., of which the tail makes 11·5 in. From the tip of the snout to the corner of the mouth, 0·63 in. To the dorsal fin, 2·52 in. To the gill-opening, 1·71 in. Length of the pectoral, 0·63 in. Height of the body, 0·63 in.

26. Leptorhinophis marginatus.

Ophiurus marginatus, *Petersb. Arch. fur Naturgesch.*, 1856, p. 272.

Green on the back, and dark yellowish-green on the ventral

aspect. Dorsal bordered with black. Pectoral and anal pale red, the latter edged with black.

Rays: Br. 21; P. 11; D. 460–480; A. 270.

Length, 24 in.; of tail, 13·6. To the corner of the mouth, 0·41 in. To the pectoral, 1·42 in. To the beginning of the dorsal, 1·93 in. Height of the body, 0·83 in.

Inhambane (East Africa).

i. *Teeth blunt; head and gape short.*

Genus 15. PISODONOPHIS, *Kaup.*

Teeth short-conic, and more or less blunt. Anterior nostril-tube well-developed, and approximating to the corner of the mouth. Pectoral more or less fully developed.

α. *Of an uniform colour, without spots or bands.*

27. Pisodonophis cancrivorus, fig. 9.

Ophisurus cancrivorus et sinensis, *Rich., Ereb. & Terr.* pp. 97, 98, from *Rich.*, pl. 50, fig. 6–9.

Ophisurus baccidens, *Cantor, Mal. Fish.*, p. 320, pl. 5, f. 1.

The margin of the upper lip is furnished with two cuticular tags. Dorsal commencing just behind the base of the pectoral. All the teeth tri- or pluriserial.

Head conical, and the snout short and acute, with a thick, short tubular nostril on each side of it, near the lip, having an inclination backwards. Posterior nostril under the eye, rather on the inner border of the lip, and covered by a valve, which gives a downward aspect to the opening. A small, acute papilla overlies a minute notch on the edge of the lip, between the nasal openings of each side; and behind the posterior opening there is a second and more minute papilla. These appendages and nostrils give a character to the orifice of the mouth, different from that of *Anguilla* or *Muræna*. The eye is rather small. There are four conspicuous pores on each limb of the mandible, several on the under lip, and 3 rostral ones on each side, above and below the eye. The nape and throat being elastic, bulge out, and are the thickest part of the fish; they are marked on each side by about 25 fine longitudinal furrows, which run back to the gill-openings. Thirty-three gill-rays of a side maintain the elasticity of these parts. They are as fine as horse-hairs, spring from the lateral branch of the *os hyoides*, and are very curiously arranged in two layers. The rays of the left branch make an abrupt curve across the throat, and then return to the nape, circulating in their way round the left operculum. On the right side, the 20 uppermost or posterior rays run ventrad or der-

mad of the left rays, curving more than half-way across the throat, and returning over the right operculum to the nape; while the 13 anterior dextral rays sweep at once across to the left side, lying in contact with the left gill-sac, and, consequently, interiorly or dorsad of the rays which spring from the left branch; they then curve backwards across the throat to the right side, where they protrude a little beyond the edge of the other rays.

Gill-openings wider than those of *Muræna*, and lower down, being similar in appearance to those of *Anguilla*. Branchiæ, 4, with 5 openings at their bases into the gullet. Pharyngeal bones armed with minute teeth. Heart posterior to the branchiæ, and placed between the hinder lips of the gill-openings. The humeral arch is composed of 2 slender bones, on each side, which do not meet their fellows on the ventral line. Pectoral fin oval, of moderate size, sustained by 16 branching rays.

Body nearly cylindrical; the back carrying its roundness far past the anus; and the tail, which becomes more compressed towards its extremity, retaining its lateral convexity, its tip being conical. The dorsal and anal carry their height well down to the tail, a slight increase taking place just before they suddenly slope off, leaving the extreme point of the tail destitute of rays, but edged above and below by a scarcely perceptible cutaneous seam. The anus is placed at about one-twelfth of the whole length of the fish, before the middle. The skin is smooth, without scales, and without a visible lateral line.

After long immersion in spirits, the specimen has a dusky brown colour, darker on the back, paler on the belly, and without spots.

The cæcal stomach tapers to a point, and the pylorus opens obliquely through its coats, at its upper end, so as to form a valvular obstruction to the regurgitation of the fæcal matter. A spiral valve exists in the lower part of the gut, like that which occurs in the *Muræna*. The long and slender air-bladder is widest at its lower end, near the anus, and tapers upwards to a hair-like point. It is $3\frac{1}{4}$ in. long, and sends an air-duct from its middle to the œsophagus.

Teeth. Nasal disk circular, armed with about 15 crowded, round, rather flat-crowned teeth of different sizes, separated from the dental surface of the vomer by a smooth line. The vomerine teeth stand about 5 abreast; but the anterior teeth being larger, the dental band is wider there. The swelling folds of the soft palate partly overlie the posterior vomerine teeth; hence the artist has represented the dental surface in fig. 8 as tapering more towards the gullet than it does in reality. Palatine teeth smaller than the nasal ones, not quite so flat on the crowns, and disposed so as to form an elliptical plate, which has also been drawn in fig. 8 as too taper, owing to the pouting lips concealing parts. There are, in fact, 6 or 7 teeth abreast in the widest part of the plate, and 2 or 3 posteriorly. The dental plates of the mandible muster about 5

teeth abreast in the middle, and taper off gradually towards the corner of the mouth. A smooth line at the symphysis separates the teeth of each limb of the jaw from one another. The upper jaw projects so much beyond the mandible, that the whole nasal disk is anterior to the tip of the latter; and when the mouth is closed, the convex dental surface of the fore-end of the mandible applies to the anterior vomerine teeth, which correspond with them in size, and are larger than the other teeth.

Length of the fish, 24 in. To anus, 10·5 in. To gill-opening, 2·6 in. (*Rich.*)

Port Essington. In the collection at Paris, there is a middle-sized specimen, which was sent from the Mauritius by M. Dussumier. Its colour is reddish-brown, with dark dots. It measures 18·12 in., of which the tail is 7·29 in.

28. Pisoodonophis boro, *Kaup.*

Ophisurus boro et hijala, *Ham.-Gang. Fish*, pp. 20, 21, 363; *Gray, Ill. Ind. Zool.* i., t. 95, f. 1, 2.
Ophisurus immaculata, acuminata, et punctulata, *Swains. Fish*, ii., p. 334.
Ophisurus boro, harangua, hijala, rostratus, et minimus, *McClell. Apod. Fish, Beng. Calc. Journ.* v., pp. 184, 185, 211.
Ophisurus boro et hijala, *Rich., Ereb. & Terr.* pp. 99-102; *Cantor et Bleeker.*
Ophisurus bengalensis (Paris Mus.).
Conger microstoma, *Eydoux et Soul. Bonit.* i., p. 205, pl. 9, f. 3.

Dorsal commencing nearly an inch behind the gill-opening; two small cutaneous tags on the edge of the upper lip. This species comes near to *cancrivorus;* but is more slender, and has a smaller head. (*Kaup.*) In its dentition it resembles that species; but the dental bands are narrower, and the teeth composing them smaller and more uniform in size, except the central nasal ones, which are a little larger. In one specimen there are only 3 teeth; and there are generally about three irregular rows on the vomer, palatines, and mandible. (*Richardson.*)

A specimen from the Deccan, preserved in the Leyden Museum, is greenish on the upper parts, with minute specks, and the whitish dorsal has a very narrow, dark edging. The example in the French Museum (*Conger microstoma*) measures 37·45 in. in length.

Ophisurus hijala is the young fish with less-developed teeth.

India.

29. Pisoodonophis pallens.

Ophisurus pallens, *Rich., Ereb. & Terr.* p. 101.

The dorsal commences as far behind the gill-opening as that orifice is distant from the tip of the snout.

Nasal teeth 5 in number, the odd one being in front. Palatine

teeth biserial, meeting the vomerine ones immediately behind the nasal disk. Mandibular teeth biserial in front, uniserial posteriorly. All the teeth short and conico-subulate, or conic and acute; the nasal and front mandibular ones being stouter and more prominent than the others. Dorsal and anal fins ending opposite to each other, and within two lines of the tip of the tail.

The general appearance of this species is like that of *hijala*. Its lateral line is similar; but the pectoral is considerably smaller. The vertical fins are low, and taper gradually away. A pale honey-yellow, or faint wood-brown, is the colour of the upper parts, and the belly is lighter. There are no spots. The specimen in the British Museum was brought from China by John Reeves, Esq., and has been immersed in spirits for many years. Its length is 11·9 in. To anus, 4·4 in. To gill-openings, 0·85. Length of pectoral, 0·40 in. Length of gape, 0·35 in. (*Richardson.*)

China.

30. Pisoodonophis rutidoderma.

Ophisurus rutidoderma, *Blkr. Muræoiden*, 28.

Pectoral rounded at the tip, having about one-third of the length of the head, and commencing twice its own length behind the gill-openings. Two small cutaneous tags on the upper lip. Five or 6 nasal teeth placed in two cross rows. Palatine teeth biserial, the inner row containing 7, and the outer one, 16. Vomerine teeth 24, standing in two rows. Exterior row of mandibular teeth containing 20; inner row, 12. Skin smooth, with longitudinal furrows. Colour of the upper parts olivaceous, of the lower ones pale green. Pectorals orange-green; anal yellowish-green.

Rays: Br. 26; D. 472; A. 311; P. 13.

Malay Archipelago.

31. Pisoodonophis rutidermatoides.

Ophisurus rutidermatoides, *Blkr. Mur.*

According to Bleeker this is a different species, having a more slender body and a considerably shorter head, also more numerous teeth, and the dorsal originating more anteriorly, or only one-third of the length of the head from the gill-opening.

Nasal teeth 4, in two rows. Palatine teeth numbering 15 on the inner row, and 25 in the exterior one. Vomerine teeth, 30, biserial anteriorly. Mandibular teeth, 30 in the outer row, and 20 in the inner one.

The body and fins are green, the back darkly nebulous, and the dorsal and anal fins brown, with blackish margins.

Rays: Br. 26; D. 475; A. 310; P. 13.

Java. The specimen measured 24 in. (*Bleeker*).

32. Pisoodonophis Macclellandi.

Ophisurus McClellandi, *Blkr. Mur.* 33.

Dorsal commencing one-third of the length of the head, behind the gill-openings. Pectorals one-third of the length of the head.

Nasal teeth 5-6, in two rows. Outer row of palatine teeth, 20; inner row, 12. Vomerine teeth 36, ranged anteriorly in four rows, posteriorly in a single row. Mandibular teeth, 20, in the outer row, 16 in the inner one. Skin smooth, finely wrinkled longitudinally.

Colour of the head and back, deep green; of the belly, yellowish-green; of the dorsal, green, edged with brown; of the pectoral, green; and of the anal, orange-yellow.

Rays: Br. 26; D. 437; A. 284; P. 13.

Spec. 22·5 in. long.

Batavia.

33. Pisoodonophis hypselopterus.

Ophisurus hypselopterus, *Blkr. Mur.* 34.

Dorsal commencing half the length of the head behind the gill-opening; and the roundish pectoral measuring only a quarter of the length of the head.

Nasal teeth, 12, quadriserial, longer than the others. Palatine teeth also quadriserial, of even height. Vomerine teeth pluriserial. Mandibular teeth quadriserial. All the teeth granular.

Colour, pale green; the fins yellowish.

Rays: Br. 31; D. 386; A. 261; P. 12.

Length of specimen, 25·2 in.

Borneo. River of Bandjermassing.

34. Pisoodonophis brachysoma.

Ophisurus brachysoma, *Blkr. Bydr. van Celeb.* 38.

Dorsal commencing one-fifth of the length of the head, behind the gill-opening. The roundish pectoral one-third of the length of the head. Teeth on the nasal disk, 18; the others disposed in four or five rows. The vomerine teeth extend further back than the palatine or mandibular ones. Skin finely wrinkled, dark olive on the upper parts, lighter on the belly. Dorsal deep green, with a black edge.

Rays: Br. 23; D. 304; A. 200; P. 15.

Spec. 29·2 in. long.

Macassar.

35. Pisoodonophis Schaapi.

Ophisurus Schaapi, *Blkr. Mur.* 53 (*addit.*).

Dorsal commencing one-quarter of the length of the head, behind the gill-openings. Pectoral round, one-quarter of the length of the head.

Nasal teeth 22, disposed in four rows; all the teeth blunt, granular, pluriserial. Vomerine teeth, quinqueserial anteriorly; triserial posteriorly. Skin smooth, minutely wrinkled, of a green colour above, yellowish on the belly, edges of the dorsal and anal brown.

Rays: Br. 24; D. 310; A. 218; P. 15.

Length of spec. 30 in.

Pankalpinang. Bankae Island.

36. Pisoodonophis Hoeveni.

Ophisurus Hoeveni, *Blkr.*

Dorsal commencing the length of the eye behind the gill-openings. Pectorals three and a half times the length of the head. Upper lip furnished with cutaneous tags.

Nasal teeth, 10, longer than the others. All the teeth triserial, blunt. Skin smooth, green above, yellowish beneath. Fins yellowish; the dorsal edged with black.

Rays: Br. 21; D. 234; A. 137; P. 17.

Length of the specimen, 8·5 in.

Macassar.

37. Pisoodonophis potamophilis.

Ophisurus potamophilus, *Blkr. Add. zu Muræn.*

The low dorsal fin commences two-thirds of the length of the head behind the gill-cavities; and the pectoral, which is four and a half times the length of the head, is roundly obtuse. Anal fin low, and beginning in the anterior half of the body. Upper lip furnished with cutaneous projections. Lateral line conspicuous.

Nasal teeth, 25. Palatine teeth disposed in six rows. Vomerine teeth in 3-6 rows. Mandibular teeth in 4-6 rows.

Colour, brownish-green above, yellowish or white on the belly. Dorsal greenish, edged with black.

Rays: Br. 31; D. 388; A. 275; P. 11-12.

Length of specimen, 32·5 in.

In the rivers of Sambas.

38. Pisoodonophis breviceps.

Ophisurus breviceps, *Rich. Ereb. & Terr.* (*nec Cantor*).

A very short, 12-rayed pectoral attached like a valve to the lip of the gill-opening.

The dorsal begins near the occiput, and tapers gradually away, so as to become nearly imperceptible before it actually terminates, about 5 lines from the tip of the tail, which is compressed. The anal vanishes in a similar way, opposite to the end of the dorsal. Head short and thick, with a comparatively wide snout. Eye and

gape both small. The group of bluntish teeth on the nasal bone circular, separated from the triserial vomerine ones, which end far back in a single row. Palatine teeth small, blunt, biserial, soon terminating in accordance with the small gape.

Length, 38 in. To anus, 18·75 in. To gill-opening, 3 in.

The specimen came to the British Museum from the College of Surgeons. Its native country is unknown.

39. Pisoodonophis lumbricoides.

Ophisurus lumbricoides, *Blkr. Mur.* 32.
Ophisurus breviceps, *Cantor, Mal. Fish*, 326, t. 5, f. 4.

The pretty long pectoral measuring one-third of the length of the head. The dorsal beginning half the length of the head behind the gill-opening. Palatine teeth biserial, numbering 16 in the outer row, and 4 on the inner one. Vomerine teeth, 42, triserial, 18 on each of the lateral lines, and 6 shorter ones on the medial line. Mandibular teeth, 23 in the outer row, 16 in the inner one. Colour greenish. (*Blkr.*)

Rays: D. 430; A. 286; P. 13.

Java. Hindostan.

β. With round spots.

40. Pisoodonophis maculosus.

Muræna maculosa, *Cuv. Regn. An.* ii., p. 351, in notes.
Ophisurus ophis, *Lacep.* 11, pl. 6, f. 2.
Ophisurus pardalis, *Val., Webb. & Berth. Can.* 90, pl. 16, f. 2.
Ophisurus maculosus et pardalis, *Rich., Ereb. & Terr.* p. 102; *Blkr. Mur.* 29.

Dorsal beginning at the occiput. No labial tags. Body marked with round, brown spots, in three rows, arranged quincuncially.

Teeth all small, conic, and acute; eight stand irregularly on the oval disk of the nasal bone; while the vomerine, palatine, and mandibular ones are biserial. The semicircular pectoral is small and delicate; but sufficiently visible to the naked eye, and it is supported by 15 rays. (*Richardson.*)

As Richardson rightly conjectures, there is no difference between *maculosus* and *pardalis*, as I have ascertained by comparison of specimens bearing the two designations in the Paris Museum.

Rays: Br. 25; D. 510; A. 318. (*Blkr.*)

Madagascar: Lancerota, one of the Canaries, in rocky basins. Banda Neira. (*Blkr.*)

41. Pisoodonophis guttulatus, fig. 10.

Pisoodonophis guttulatus, *Kaup.*

Dorsal beginning at the occiput. Many round, white spots on

the head. Three rows of pisiform spots quincuncially arranged on the body. Pectoral roundish, broader than long, supported by 20 short rays, too delicate to be readily distinguishable. Lower parts whitish throughout.

A young individual has fewer spots on the head, and only two rows on the body. On the dorsal there is only one row, and its edge is white. A large example measures 36 in., of which the tail constitutes 21 in.

Martinique. Two specimens in the Paris Museum sent by MM. Plée and Neumann.

42. Pisoodonophis oculatus.

Ophisurus oculatus, *Schl. Leyden Mus.*

This species resembles *semicinctus* of Richardson; but has a blunter head, shorter pectorals, which are broader than long, and differs, moreover, in its markings. On the head there are several rows of white spots, edged with black; three on each side behind the eyes, six between the anterior corner of the eyes, and four on the snout, whose tip is spotted with black, and its medial line white. On the mandible there are two rows of spots, less distinct. There are three large spots on the occiput, whose median region is whitish, with dark spots. Twenty-nine ocellated spots occur on the back. Under the lateral line there are twenty-three such spots, alternating with the upper ones; but all of them have not the white centre. The yellowish dorsal fin has black spots on its edge; and the anal, which is coloured yellowish like the belly, is without spots. The long tubular anterior nostril has a papilla on its side.

This handsome species measures 30·7 in., of which the tail makes 12·2; the head up to the gill-opening, 2·4; and the pectoral is 0·2 in. long.

Curaçoa. Leyden Mus.

γ. With bands.

43. Pisoodonophis semicinctus.

Ophisurus semicinctus, *Rich., Ereb. & Terr.* p. 99.

Face and long anterior nostril tubes covered with irregular dark dots. Pectoral as long as the gape. A black occipital spot flanked by two others. Eighteen large blackish bars passing half round the body. No cutaneous tags on the lips.

The nasal teeth, about 33 in number, are disposed on a convex oval disk, which is not separated from the vomerine teeth by a distinct line. The latter run far back, and anteriorly stand in two rows, in the middle in four, and again in two posteriorly. The palatine teeth form two or three irregular rows, which are increased to four near the symphysis. The dorsal commences about an inch before the gill-opening, and, together with the anal, carries its

breadth to near the tip of the tail, where both fins slope suddenly away. At its extreme tip, the tail is roundish, conical, and rigid; but not pungent. Pectoral fin moderately large, sustained by 12 rays, and edged at the tip with brown.

Length, 28·75 in. To anus, 12·25; to gill-opening, 3·12 in. (*Richardson.*)

The British Museum possesses three specimens from the River Gambia; the Paris one, two from Goree.

44. Pisoodonophis fasciatus.

Ophisurus fasciatus, *Rich., Ereb. & Terr.*
Muræna fasciata, *Thunberg, Lp. Ichth.* t. 2. f. 1.
Gymnothorax fasciatus, *Bl. Schn.* 529.
Ophisurus alternans, *Quoy & Gaim. Voy. de Frey.* pl. 45, f. 2.

Bluish-grey, varied by 31-33 chestnut-brown rings, having frequently one or two round spots between them, placed one over the other.

This is a very slender fish, with the rudiments of pectorals scarcely visible. Mandibular teeth uniserial, or sub-biserial. Vomerine teeth biserial. Tail a little longer than the body.

Malayan Archipelago. Many specimens in the British and French Museums.

Sub-Family 2. SPHAGEBRANCHINÆ.

Genus 16. LAMNOSTOMA, *Kaup.*

Dalophis, *Cantor et Bleeker nec Raffinesque.**

Foremost nostril situated on the under border of the broad, compressed, sharp-pointed snout; it has no tube; but is ear-shaped, with a cutaneous tag on its inner edge. The dorsal and anal do not go round the point of the tail.

45. Lamnostoma pictum, fig. 11.

Manti-bukaropaum, *Rus.* i. t. 37.,
Dalophis orientalis, *McClell.*

A handsome, and lively, and variously-coloured species. Head gray, with fine brown points; lighter round the eyes and on the lips. A band of round spots crosses the occiput, and is connected with two short longitudinal bars, which run backwards from the

* The genus *Dalophis* of Raffinesque contains two known species, *imberbis* (*bimaculata*, Raff.) and *Apterichthys cæcus* (*Dalophis serpa*, Raff.), which have been brought together by fictitious characters. If the name of *Dalophis* is to be retained it must be applied to *imberbis*.

eyes. A dark stripe extends along the whitish dorsal fin, that begins behind the gill-openings; while a bluish stripe passes down the lateral line, whose pores are whitish. Belly yellowish. Another example has more of a greenish-brown colour, with a yellowish neutral aspect.

On the nasal bone, there are 7 rather large teeth, disposed in two rows, with the odd one in front. The palatines and mandible are each armed with 19-20 small teeth. On the vomer there are about 12 teeth.

Deccan. Leyden Museum.

46. Lamnostoma bicolor.

Lamnostoma bicolor, *Kaup*.

This species has a broader suddenly-pointed snout, and a porous cross-bar on the occiput. A row of pores extends in an arch over the throat to the lateral line; while a straighter line, composed of 10-11 pores, begins near the corner of the mouth, and runs backwards; but does not reach as far as the gill-cover. Colour of the dorsal aspect, dark; of the ventral one, whitish, with fine dark points near the lateral line. The tail is longer than the body.

Entire length, 16·31 in. Length of the tail, 8·43 in.

Borneo. Leyden Museum.

Genus 17. ANGUISURUS, *Kaup*.

Resembles the preceding genus; but the snout is more cylindrical, and the fore nostril has no rudimentary tube, but is open and free.

47. Anguisurus punctulatus, fig. 12.

Anguisurus punctulatus, *Kaup*.

Snout higher than broad. Head whitish, marbled with a white cross-band on the occiput. Divers distinct spots on the dorsal fin, and a row on the lateral line, with white connected markings below them. Dorsal fin whitish. Upper surface of the body, bluish, with fine black points; under parts, whitish. Tail shorter than the body.

Length, 13 in., whereof the tail forms 6·10 in.

Java. Five specimens in the Leyden Museum.

Genus 18. SPHAGEBRANCHUS, *Bloch*.

Dalophis, *Raff.*, *Cantor*, *Bleeker*.

Front nostrils with short tubes. Snout more round, not com-

pressed, and somewhat arched. Pectorals rudimentary. Rays, 3, or wholly wanting.

Cantor and Bleeker describe Indian species destitute of pectorals, with which I am not acquainted.

48. Sphagebranchus imberbis.

Sphagebranchus imberbis, *Delaroche, An. du Mus.* xiij. p. 360, t. 25, f. 18.
Dalophis bimaculata, *Raff. Caratt.* tab. 7, f. 2.
Sphagebranchus imberbis et oculatus, *Risso*, 196 (*according to Bonap.*).

Dorsal fin commencing as far behind the gill-opening as the distance from that opening to the point of the snout measures. Tail a little longer than the body. Five nasal teeth in two rows, the solitary one in front. In old specimens, two irregular rows of teeth on the fore part of the vomer, and one towards its end. Head and body, but not the belly, dotted with black on a green or brownish ground.

This species reaches a considerable length. The largest specimen, which was sent from Toulon by Mr. Kiener, measures 25·79 in. Another example preserved in the Leyden Museum is 8·27 in. long in the body, the length of the tail being 9·85 in.

Sicily, Toulon, &c.

49. Sphagebranchus rostratus.

Sphagebranchus rostratus, *Bloch, Ichth.* t. 419, f. 2; *Schneider, Syst.* i., 539, t. 103, f. 2.

"S. Labio superiore in rostrum elongato, cirrhis 2 rostro extremi insident."

Surinam Rivers. (*Bloch.*)

50. Sphagebranchus brevirostris.

Sphagebranchus brevirostris, *Peters. Arch.* 1856, p. 273.

Teeth uniserial on all the dentiferous bones; those of the upper jaw very small and serried; the mandibular ones longer and more recurved; while the vomerines are nearly as tall but more distant. Nasal teeth 5, the odd one in front; the snout with its teeth projecting beyond the mandible. The anterior nostril tube is situated behind the nasal bone, and is pendulous; the posterior one is near the angle of the eye. Gill-rays, 28.

Colour of a soiled flesh tint, passing into olivaceous.

Length, total, 10·24 in. Of tail, 5·64 in. To the gape, 0·39 in. To the eye, 0·12 in. To the dorsal, 1·20 in. This species has comparatively a shorter snout than *rostratus*. The specimen originally described is in the Museum at Berlin.

51. Sphagebranchus moluccensis.

Dalophis moluccensis, *Bleeker*.

Snout convex and pointed, twice the length of the diameter of the eye. Fore nasal tube shorter than that diameter. Upper jaw much longer than the under one. Lateral line composed of white pores, beginning close behind the eye. Dorsal fin beginning half the length of the head behind the gill-opening, *notched towards the end*. Anal fin higher than the dorsal, also notched.

Upper surface of the fish, olivaceous-brown; under one yellowish. The pores of the lateral line tinged with yellow. Fins yellowish.

Length, 15·78 in. Tail half that length.

Nasal teeth, 6, in two ranks. Vomerines, 12–14, whereof 8 stand in two rows, the rest being in a single series. Palatines, 24. Mandibular teeth, 24.

Rays: Br. 23; D. 510; A. 175 (*Bleeker*).

Ceram.

52. Sphagebranchus polyophthalmus.

Dalophis polyophthalmus, *Bleeker*.

Snout feebly convex, twice the length of the eye. Fore nostril tubular. Upper jaw much longer than the under one. Lateral line commencing at the cheek, studded with pores, which are scarcely visible. Dorsal fin beginning a quarter of the length of the head behind the gill-opening, not notched towards the end, as in the preceding species, and of equal height with the anal.

Upper surface green, under one yellow. Head and body marked with yellow-eyed spots, and the occiput by a yellow cross-bar. The side is traversed by a longitudinal row of yellow-eyed spots. Teeth on the palate bone, 36; on the vomer, 18; on the mandible, 40.

Rays: Br. 25; D. 360; A. 140.

Length, from 6½ in. to 9 in., whereof the tail forms one-half.

Priamon (*Bleeker*).

53. Sphagebranchus? marmoratus.

Dalophis marmoratus, *Bleeker, Muræoiden, &c.*.

Snout convex, drawn to a point, and twice the length of the diameter of the eye. Front nostril tubular. Lateral line porous. *Dorsal fin commencing over the angle of the mouth*, not notched towards its extremity. *Anal fin measuring one-third of the length of the body*. Head varied and marbled with brown and yellow. Body and fins brown, with irregular yellow spots.

Nasal teeth, 4, disposed in two rows. Palatines, 12. Vomerines, 10–12, the anterior ones forming two rows, the hinder ones only one.

Mandibulars, 12. All the teeth conical, pointed, and of various heights.

Rays: Br. 23; D. 510; A. 175.

Sumatra. One specimen measured 34·3 in. in length (*Bleeker*).

This species seems not to belong to this place, since it departs from the generic character in many essential points.

54. Sphagebranchus anceps.

Dalophis anceps, *Cantor*, *Mal. Fish*, tab. 6, 1-4.

Head comparatively short, and terminating in a short conical muzzle. Eye very minute. Measured to the gill-opening, the head is found to be $\frac{1}{19}$th of the total length; and its length is contained ten times and three-quarters in the distance between the muzzle and the anus, which terminates the fourth-seventh of the total length. There are 3 pores on the snout, and 5 on each branch of the mandible. The tube of the anterior nostril is double the length of the eye. Beneath the tip of the muzzle, there appears a double series of 3 teeth each. Vomerines, biserial at first, near the end, uniserial. Palatine teeth uniserial. Mandibular teeth, biserial at the symphysis. The dorsal begins at one-eighth of the total length.

Ground colour, yellowish-white, so sparingly dotted with brown as merely to acquire a greyish or dusty appearance; beneath the lateral line, there is a pale bluish-grey longitudinal stripe. Abdomen, white; dorsal and anal fins, hyaline, the lower half of the former dotted with brown. (*Cantor.*)

Penang.

Genus 19. CIRRHIMURÆNA, *Kaup.*

Edge of the upper lip furnished with a great number of short irregularly-formed mustache filaments. Head small, elongated, compressed, and sharply pointed. Snout a little longer than the pointed mandible. Fore nostril shortly tubular, situated on the edge of the snout; the hinder one on the inner side of the lip. On the circumference of the whole upper lip, there are about 17 short mustache feelers.

Pectoral fin, narrow and longish. Eye situated over the middle of the jaws. Teeth very fine; 2 rows on the palatine bones; a single series on the vomer and mandible. Low dorsal and anal fins, which do not wholly surround the tail.

55. Cirrhimuræna chinensis.

A not very greatly-elongated form, in which the beginning of the dorsal and of the pectorals correspond, the latter having 9 rays.

Colour, yellowish-brown, with fine dark points along the dorsal fin.

Length of the head measured to the base of the pectoral, 0·75 in. Of pectoral, 0·36 in. To anus, 2·54 in. Length of tail, 4·65 in.

China (British Museum). Macassar (Leyden Museum).

? Quid Sphagebranchus catostomus, *Bl. & Schn. Syst.* p. 536. *Rostro acuto cirrhis 4, capite poris perforato ?*

Habitat in mari insulam "Otahaite" ambiente.

Genus 20. CALLECHELYS, *Kaup.*

Short oval head, straight depressed snout, and very short mandible. Fore nostril tube dependent; the hinder one situated under the eye, and furnished with a small flap. *No pectorals.* Highly-developed dorsal; less expanded anal. Only a solitary nasal tooth, which is large, elongated, blunt, and inclined backwards. Eight teeth implanted in the elliptical palatine bone, which are short, slender, and curved. About 10 vomerines, of which the 6 anterior ones are stouter, and are ranged in two rows. Twenty-four teeth stand on the entire border of the mandible.

56. Callechelys Guichenoti, fig. 13.

This handsome eel is named in honour of a man to whom I owe a deep debt of gratitude for the friendly assiduity with which he furthered my labours in the Paris Museum.

The whole body is dotted and freckled with black, on a dark blue, or perhaps greenish, ground-colour. Towards the end of the tail, the black predominates. Fins white, with a broadish irregular black border.

Whole length, 18·70 in. Length of tail, 6·90 in.

Otaheite. (Paris Museum by M. Dubois.)

Genus 21. ICHTHYAPUS, *Barnaville.*

Destitute of all the fins. Snout elongated like that of a dog-fish, with a short pointed mandible. Towards the beginning of the under plane of the snout are situated the very singular large, round, outwardly-dentated tubes of the fore nostrils, whose borders, like the unfolded bud of a flower, are curved inwards. The hinder nostril opens in a slit of the inner lip. Eyes situated over the middle of the jaws. Body destitute of fins, showing in place thereof a sunken cutaneous furrow. Lateral line very distinct, and furnished with pores, which are placed widely distant from each other. Teeth very fine, small, and incurved. Nasal teeth placed in the middle of a slit of the rostral skin. Vomerines one-ranked.

57. Ichthyapus acutirostris.

Ichthyapus acutirostris, *Barnaville, Guer. Rev. Zool. Juill.* 1847.

A very small thin vermiform fish, of a brownish colour. Five pores in a row, which crosses the occiput; 4 between the point of the snout and the eyes; 3 behind the eye, running up from the border of the lip; one on the middle of the forehead; and 6 on each limb of the mandible.

Length, from the tip of the snout to the gill-opening, 0·79 in.; to the anus, 4·14 in. Length of tail, 4·92 in.

Equatorial ocean, far from land. (Paris Mus., M. Rang.)

Genus 22. OPHISURAPHIS, *Kaup.*

This resembles the preceding genus; but the fore nostril tubes have the customary short form. The hinder nostrils, placed before the eyes in the inner lip, are not visible; but may be detected by the help of a needle. The punctiform eyes are situated nearer to the point of the snout. All the teeth are small, pointed, and recurved. The nasal teeth stand between the lips of a cleft in the rostral integument. These few mesial teeth end near the beginning of the palatines. I could detect no vomerine teeth.

58. Ophisurapus gracilis.

Still thinner and more elongated than the preceding.

Length, to the angle of the mouth, 0·24 in.; to the gill-opening, 0·67 in.; to the anus, 4·02 in. Length of the tail, 5·81 in.

Allied to this is the

59. Sphagebranchus quadratus.

Sphagebranchus quadratus, *Rich., Voy. of the Sulph.*, pl. 52, f. 8-15.

Which is less elongated, and has two rows of vomerine teeth. On a further examination, this species may prove to be the type of a proper group.

Sub-Family 3. MYROPHINÆ.

Anguilliform. Dorsal and anal encircling the tail.

Genus 23. MYROPHIS, *Lutken.*

Two long irregular rows of teeth on the closely-approximated vomerine and palatine bones; also on the mandible. Three pairs of teeth on the nasal bone. Dorsal fin commencing at four lengths

of the head from the tip of the snout. Pectorals short; but distinctly visible.

60. Myrophis longicollis.

Anguille à long col., *Lacep.* ii., iii., f. 3. (Muræna myrus.)
Anguilla longicollis, *Cuv. Reg. An.* ii., 350.
Myrophis punctatus, *Lutken.*

Cuvier, not taking into consideration the position of its nostrils, enumerated this species among the eels, from which it is dissociated by all its other external characters. These make it a genuine *Ophisurus*, in whose vicinity it must be placed, notwithstanding that the tail, as in the true eels, is encompassed by the dorsal and anal fins.

In a specimen whose total length amounts to 14·78 in., the tail constitutes 8·31 in. Length, from the tip of the snout to the corner of the mouth, 0·47 in.; to the gill-opening, 1·85 in.

The specimen in the Paris Museum came from Surinam. It is enveloped in a yellowish slime, under which the true colour has not been preserved.

Genus 24. MURÆNICHTHYS, *Bleeker.*

Murænichthys, *Bleeker, Muræn. &c., Batavia*, 1852, p. 42.

Without pectorals. Teeth short, conical, and granular.

Descr. The medial nasal teeth, in conjunction with the vomerines, are disposed in from three to five ranks, and form a round tessellated plate, arched in the middle. Palatine teeth, triserial; mandibulars, tri- or quadriserial. Head short, blunt, and arched; the hinder nostril labial, placed before and below the border of the eye. Seven rostral pores under and round the eye. Five mandibular ones. The moderately low dorsal fin begins five lengths of the head from the tip of the snout.*

61. Muræniichthys gymnopterus.

Murænichthys gymnopterus, *Bleeker, Muræoiden, &c., Batavia*, 1852, p. 42; *Verh. Bat. Gen.* xxv., p. 52.

Body greenish above, sprinkled with fine dark points; yellowish beneath. Fins yellowish, with dark specks at the base. Anal fin bordered with crimson. White equidistant pores on the lateral line. Head of the young fish blunter than that of an older one.

Entire length, 13 in., whereof the tail is 7·88 in.; and the head, measured to the gill-opening, 1·57 in.

Rays: Br. 32; D. 260–265; A. 200–212; C. 10 (*Bleeker*).

Java (*Bleeker*). Macassar (Leyden Mus.).

* Measured to the true end of the jaws, and not to the gill-opening.

Genus 25. MYRUS, *Kaup.*

Possessing pectorals, and teeth disposed, many in width but without order, on the dentiferous bones of the mouth. Dorsal fin beginning over the tip of the pectoral.

62. Myrus vulgaris, fig. 14.

Conger myrus, *Cuv. Reg. An.* ii., 550.
Echelus punctatus, *Raff.* 65–171, t. 17, f. 1.
Muræna myrus, *Linn.* No. 5; *Gmel.* 1134; *Risso, Ichth. de Nice,* p. 30; *Bl. Schn.* 488; *Richardson, Ereb. & Terr.* 108; *Rondel,* 407; *Costa, Fauna Nap.* t. 29; *Bon. Cat. Meth.* 38, No. 324.

Nasal disk roundish, or slightly oval, armed with short conical acute teeth, biserial on the border; the outer series containing about 15, the inner one about 8; also 2 on the mesial line, larger than the others, one of them being a little behind the disk. Dental surface of the vomer elliptical, and acute at both ends, armed with small teeth of various sizes, some of them flattish and rounded, others more acute. Palatine teeth acerose or short, slender, cylindrical, and more or less acute, crowded without order; but standing 4 or 5 in the width of the bone, which abuts anteriorly against the nasal disk. The mandibular teeth are similar to the palatine ones; but the band they form is slightly narrower.

In this genus the body tapers considerably, and the head is longish and narrow. The snout being depressed is acute in profile; but appears obtuse when viewed from above. Eyes large, situated over the angle of the mouth, and more than a vertical diameter of the orbit distant from each other. The gape is large, exceeding the moderate-sized pectoral in length. Lateral line composed of a chaplet of little elliptical elevations, with white dots at equal intervals.

Fins pale, with black edges. Body brownish-grey above, in a specimen that has been long macerated in spirits, the colour being partly produced by densely crowded, very minute, dark, ash-grey dots. A porous white band crosses the occiput, and joins another, which runs along the temples over the base of the pectorals; one passes under the eye, and the pores form various lines on the snout. There are also 3 short longitudinal bars on the top of the head before the transverse occipital one. (*Richardson.*)

Length, 23½ in. To anus, 9½ in. To gill-opening, 2½ in.

Bay of Naples. (S. P. Pratt, Esq., Brit. Mus.)

Section II. *PHANEROMYCTERES.*

Hinder nostril situated either before or over the eye, and so plainly exposed that the name of *Phaneromycteres* may be fairly applied to this section.

The group breaks up into the following families: *Anguillidæ*, *Muræniдæ*, *Congeridæ*, and *Synbranchidæ*.

Family I. ANGUILLIDÆ.

This second family of the Apodes is composed of the true eels, which have their teeth more cardiform, gill-openings lateral, conspicuous pectorals, and the tail encompassed by the union of the dorsal and anal fins.

Sub-Family I. ANGUILLINÆ.

This sub-family embraces the eels, properly so named, which have head and tail both obtuse, and whose skin, in drying, exhibits imbedded scales, placed longitudinally, transversely, or obliquely.

The major part seem to be inhabitants of the sea. Though I have described a considerable number, yet a careful examination of all seas, lakes, and rivers might detect a still greater number, which as yet remain unknown to naturalists. I commence with the large-eyed species of Southern Europe, which have a very short snout.

a. *Large-eyed species, with abbreviated snouts.*

63. Anguilla Kieneri, fig. 15.

Diagn. Diameter of the large eye somewhat exceeding the short snout in length.

At the first glance, one might be tempted to consider this species as the type of a new genus; but on a strict comparison of it with the following three species, which have conical teeth, it does not appear to be distinguished from them by any important assemblage of characters; and were we to constitute a new genus for its reception, the other three must also be included in it.

This species is greenish, dotted with black, lighter on the under side. Entire length, 11·03 in. To the anus, 4·92 in. To the angle of the mouth, 0·39 in. To the gill-opening, 1·58 in. To the beginning of the dorsal fin, 3·43 in. Length of the pectoral, 0·83 in. Height of the body, 0·47 in.

The forehead is rendered concave by the enormous eyes rising above it. The body is peculiar in being equally thick for nearly its

whole length, and much laterally compressed. The lateral line is distinct; but the dorsal and anal fins are not very high.

M. L. Kiener brought this extremely-interesting species from Toulon, in March, 1829; and I have named it after him as a mark of esteem and friendship.

Paris Museum.

64. Anguilla Cuvieri.

This name I bestow on the *Pimperneaux*, of which Cuvier correctly says, "that it has a proportionally shorter snout than the other eels, and larger eyes." In comparison with the two following species, however, which were unknown to Cuvier, it has rather small eyes, their diameter being somewhat shorter than the length of the snout. It is distinguished from the two succeeding species, (1) by having a much stouter and higher form; (2) by the back, down to the lateral line, being dark green, while the whole ventral surface under the line is silvery. The dorsal fin, which may be called low, is lighter green, with a brighter edge; whilst the anal fin is yellowish. Pectorals, yellowish outside, olive-green interiorly. Anus yellowish.

Length, 18·50 in. Length of tail, 11·61 in. Diameter of the eye, 0·28 in. Length to angle of the mouth, 0·51 in. To the pectoral, 2·08 in. To the dorsal, 5·12 in. Height of the body, 1·10 in.

Abbeville (Paris Museum. Four examples from M. Baillon).

Since this species does not inhabit England, the synonym of "*L. anguille pimperneaux*" must be withdrawn from the *latirostris* of Yarrell. (Brit. Fishes, ii., p. 298.)

65. Anguilla Bibroni, fig. 16.

Anguilla Bibroni, *Kaup.*

This species greatly resembles the *pimperneaux* of Cuvier; but is distinguished from that eel by its narrower jaws, proportionally larger eyes, smaller number of short conical pointed teeth, black pectorals, and notably slenderer body. The character by which both species may be distinguished from the remaining ones, is the largeness of the eye, whose diameter is contained only once in the length of the snout.

Upper surface, dark green; sides, silvery; belly, yellowish. Border of the anus, black. Dorsal fin, so very scanty at the commencement that it cannot be seized or raised with the nail. Its colour is that of the belly, which it preserves to the tail, where its edge is darker.

The largest specimen measures 15·54 in., whereof the tail forms 10·04 in. The diameter of the eye is 0·28 in. Length, to the

corner of the mouth, 0·32 in. To the pectoral fin, 1·73 in. To the dorsal, 4·26 in.

Sicily (M. Bibron. Four examples).

66. Anguilla Savignyi.

Anguilla Savignyi, *Kaup.*

Likewise resembles the preceding; but is distinguished by a bright olive-green colour, without the silvery sides; similarly-coloured pectorals; and a higher dorsal fin, bordered with yellow. The teeth are more numerous; but, in like manner, short, conical, and pointed. The pores of the lateral line open by short projecting tubes.

Entire length, 13·58 in. Length of tail, 7·49 in. Of pectoral, 0·67 in. Length to dorsal, 3·93 in.

Naples (Savigny, Paris Museum).

Although the label of this specimen does not state whether it is a marine or fresh-water fish, I conjecture, from a knowledge of the habitats of the other big-eyed species, that it is a marine eel, or one which lives in the mouths of rivers.

The *settembrina* and the *cloacina* (*Chiavicarola* of the Romans) are known to me merely by the outline sketches which Prince Lucien Bonaparte favoured me with; and I cannot rightly ascertain whether they are identical or not with any of the species described by me. A close examination of the fish themselves will hereafter determine this matter; and then, if they prove to be the same, the Prince's names will claim the priority. It is a pity that the Prince has given us no description of these species.

The eels which follow have more elongated snouts, and also the dorsal tolerably high throughout.

B. *More elongated snouts, and higher dorsals.*

α. *European.*

67. Anguilla capitone, fig. 17.

Anguilla capitone, *Val. Paris Mus.*

This eel, known at Naples by the name of *Il capitone*, is a marine fish, and was sent to Paris by M. Savigny. It is characterised by its short, thick, succinct shape, and by the back rising pretty high directly behind the head. The moderately large eye has a diameter equal to half the length of the snout, and is situated nearly over the corner of the mouth. As shown by the figure, the lips are greatly developed, and the mandible is so long and broad that its front teeth go beyond those of the upper jaw, and are not applied to them. In form the teeth are pointed and card-like; and

the palatines and vomerines are so disposed that the flat plates they form taper to points towards the gullet.

Colour, greenish; a lens showing innumerable black points. A broad dark lateral stripe from the head to the pectoral. Under surface of the fish, silvery grey. Anal fin, yellowish, except towards its extremity, where, like the dorsal, it becomes dark and is dotted. Pectoral, at its base and on the side next the body, dotted. The distance between the anus and the beginning of the dorsal is equal to that from the latter point to the pectoral.

Total length, 22·25 in. Length of tail, 12·21 in. To the corner of the mouth, 0·87 in. To the pectoral, 1·14 in. Circumference of the body near the pectoral, 4·92 in.

68. Anguilla morena, fig. 18.

Anguilla morena, *Val. Par. Mus.*

This likewise is a marine eel, sent from Naples by Savigny. Its oval eye is half the length of the snout, and stands so that one-third of its diameter passes the corner of the mouth. Its lips are less developed than those of the preceding species; and its vomerine teeth do not extend so far back into the mouth. The distance from the tip of the snout to the pectoral goes once and a half in that from the pectoral to the beginning of the dorsal. Like the foregoing species, it has a black longitudinal stripe, extending towards the gill-opening.

Colour, dark olive-green, with a lighter ventral surface. The pectoral is dark at its tip, and on the side next the body. All the other fins, which are distinctly developed, have a yellowish colour.

Total length, 19·29 in. Length of tail, 10·83 in. To the corner of the mouth, 0·59 in. To the pectoral, 2·28 in. To the dorsal fin, 5·63 in. Length of the pectoral, 0·75 in.

The interior of the mouth is dotted with black.

69. Anguilla melanochir, fig. 19.

Anguilla melanochir, *Valenc. Par. Mus.*

This species, collected by M. Savigny in the Tiber, is characterised by its blunt head, and entirely black colour.* Its eye stands directly over the corner of the mouth, and its diameter is half the length of the snout. The mandible seemingly overreaches the snout, rising beyond it. The lips are greatly developed. Teeth, short, conical, with sharpened points. At the broadest part of the vomer, they stand in four rows. On the palatine bones also there are four rows, which decrease to three and two posteriorly. The mandibulars form about five rows on the anterior half of the bone. The fins generally are moderately high or

* On this black colour one can place no great reliance, since the tints acquired by the eels vary with the places they inhabit.

long. Colour throughout, black; the inside of the mouth and lining of the belly, dotted with black.

Total length, 20·09 in. Length of tail, 14·43 in. To the corner of the mouth, 0·71 in. To the pectoral, 2·68 in. To the dorsal, 6·30 in. Height near the pectoral, 0·98 in. Length of the pectoral, 1·02 in.

70. Anguilla marginata, fig. 20.

Anguilla marginata, *Kaup.*

In the Paris collection there is a small eel from Valentia, in Spain; but whether it is a marine or fresh-water species, or what period of its growth it has reached, I did not ascertain. The vomerine teeth extend no further than to opposite the eye. The eye is of medium size, and its diameter is contained once and a half in the length of the snout. Black dots are sprinkled on the inner side of the moderately-developed lips. The distance from the tip of the snout to the pectoral goes once and two-fifths in that between the pectoral and the dorsal.

Dorsal surface, greenish, dotted with black; ventral aspect, silvery white. Dorsal, whitish, with dark points and a darker border. Pectoral, whitish on the outer side, with dots at the tip, and dotted throughout on the side next the body. Anal, whitish; darker towards its extremity, with dots, and edged like the dorsal. Pores of the lateral line conspicuous only near the pectoral.

Total length, 9·45 in. Length of tail, 5·51 in. To the corner of the mouth, 0·32 in. To the pectoral, 1·18 in. Distance between the pectoral and the dorsal, 1·65 in. Length of pectoral, 0·39 in.

71? Anguilla microptera, fig. 21.

Anguilla microptera, *Kaup.*

This small eel, which I was inclined to consider as the same with the preceding species, was taken in the Bay of Algesiras, and brought by the "Astrolabe" to Paris. The pupil of the eye and the corner of the mouth are in the same vertical line; and the diameter of the eye is contained once and a half in the length of the snout. Pectoral fin and mandible equal to each other in length. The distance between the end of the snout and the pectoral goes once and two-fifths in the length of the space between the pectoral and the dorsal. It is in some degree different from *marginata* (No. 70) by the extent of the vomerine teeth.

Colour, bright olive-green, with innumerable points on the transverse and oblique-lying scales. Ventral surface, smutty white.

Total length, 11·81 in. Length of tail, 6·70 in. To the eye, 0·28 in. To the corner of the mouth, 0·39 in. To the dorsal, 3·55 in. Length of the pectoral, 0·41 in. Length of gape, 0·41 in.

72. Anguilla ancidda, fig. 22.

Anguilla ancidda, *Kaup.*

This is very likely a marine eel. Two specimens of it were sent by Bibron from Sicily. It resembles *A. morena;* but has larger lips. The centre of the eye is directly over the corner of the mouth. In the development of the lips the species agrees with *A. melanochir.* Body olive-green, with innumerable black points along the scales and on the skinny intervals. Belly smoky white. A more or less distinct longitudinal yellow stripe traverses the belly and anal fin. Pectoral, of a single tint outside; dotted on the side next the body. The black bar over the gill-plate is wanting. Lateral line showing in relief.

Total length, 16·13 in. Length of tail, 9·06 in. To the corner of the mouth, 0·59 in. To the pectoral, 2·21 in. To the dorsal, 5·04 in. Height of the body near the pectoral, 0·83 in. Length of the pectoral, 0·59 in.

A single example, from Pergamont, is labelled with the Italian name of *ancidda.*

Having discussed the eels of South Europe, we proceed to the northern species.

73. Anguilla mediorostris, fig. 23.

Anguilla mediorostris, *Yarrell, Brit. Fish.* ii., p. 301.

In the Parisian collection I found this eel ticketed "*ex Insulis Danicis,*" from Mr. Richard. What Yarrell says on this species seems to me to accord exactly with it, viz. the yellowish-green colour and the very flat elongated head, showing no projection of the forehead in profile. Teeth, short, conical, and pointed, and not so close as to admit of being compared to a card. The moderately-big eye stands over the corner of the mouth, and its diameter is half as long as the snout. The lips are not greatly developed, and are of moderate breadth. The pectorals also are pretty short. The pores of the prominent lateral line form tubular projections.

Total length, 15·16 in. Length of the tail, 8·27 in. To the corner of the mouth, 0·63 in. To the pectoral fin, 1·97 in. To the dorsal fin, 5·12 in. Length of the pectoral, 0·71 in. The distance from the tip of the snout to the pectoral fin (1·97 in.) is comprised once and two-fifths in the distance between the pectoral and dorsal (2·76 in.).

74. Anguilla altirostris, fig. 24.

Anguilla altirostris, *Kaup.*

A small eel, obtained at the mouth of the Seine by M. Bosc, is preserved in the Paris collection, where it is marked erroneously *A. pimperneaux.* It is a new species, which essentially differs from

the one named *pimpernaux* by Cuvier in the smallness of the eye and the comparative length of the snout. Among all the known species, it may be known readily by the unwonted elongation of the mandible. Eye, small, its diameter being only half the length of the flat and pointed snout; its pupil is placed directly over the angle of the mouth. Mandible, comparatively high, having a height about equal to two diameters of the eye. Its length corresponds with that of the short pectoral. The distance between the tip of the snout and the base of the pectoral amounts to once and three-fourths the distance between the pectoral and dorsal fins. Lateral line showing in relief, with projecting pores. Colour, olive-green above; yellowish beneath. Innumerable black points can be seen on the back and sides by the aid of a lens. Pectoral, yellowish exteriorly; olive-coloured on the side next the body.

Total length, 12·60 in. Length of tail, 7·29 in. To the corner of the mouth, 0·36 in. To the pectoral, 1·38 in. To the dorsal, 3·94 in. Length of pectoral, 0·39 in.

75. Anguilla platycephala, fig. 25.

L'anguille verniaux, *Cuvier*.
L'anguille platbec, *Cuvier*.

Centre of the eye placed over the angle of the mouth; and its diameter contained about twice in the length of the depressed snout. Lips, thin. Vomer extending to the front of the orbit. Pectorals as long as the mandible. The distance from the tip of the snout to the pectoral is not contained twice in the distance between the pectoral and dorsal fins, the proportion being as 1 : $1\frac{4}{5}$, or as 1 : $1\frac{2}{3}$.

Colour of the dorsal aspect, olive-green; silvery under the distinctly porous furrowed lateral line; belly and fins yellowish. Innumerable dark points sprinkled over the sides, back, and dorsal fin.

An example of this species, which measures 15·74 in., has the following lengths of parts:—Of the tail, 9·06 in. To the corner of the mouth, 0·51 in. To the pectoral, 1·81 in. To the dorsal, 4·72 in. Length of the pectoral, 0·51 in. Height of the body near the pectoral, 0·83 in.

That this is the *Anguille platbec* of Cuvier, of which Yarrell (ii., p. 299) has given a figure (the "Grig"), I cannot at present precisely determine; or whether it is correctly separated, as a species, from *latirostris*, or not. The specimen which I have described above is in the Paris collection, and was taken at Abbeville by M. Baillon.

76. Anguilla latirostris, fig. 26.

Broad-nosed eel (Anguilla latirostris), *Yarrell*, ii., p. 298.

The moderately large eye stands over the corner of the mouth, and its diameter is not comprised quite twice in the length of the

snout. Teeth, short and blunt, and forming from four to six rows in a broad dental surface. Vomer reaching to the fore angle of the eye. The distance between the tip of the snout and pectoral is to that between the pectoral and dorsal as 1 to $1\frac{3}{4}$. The greatly-developed pectoral generally exceeds the mandible in length, and is more rarely only equal to it.

Colour of the dorsal aspect, bright olive-green, with innumerable black points. Ventral aspect and anal, yellowish. Outer side of the pectoral, whitish; irregularly spotted and olive-coloured on the inner side. Lips, spotted in front, and at the point almost black. The largest specimen measures 21·07 in. The length of the tail is 11·62 in. To the corner of the mouth, 0·83 in. To the pectoral, 2·80 in. To the dorsal, 7·09 in. Length of the pectoral, 0·91 in. This specimen was from "L'Orient," and was found among the sea-wrack and fucus, portions of which were contained in its stomach. It is both a marine and fresh-water species.

77. ANGUILLA ACUTIROSTRIS, fig. 27.

Anguilla acutirostris, *Kaup.*
Anguille longbec, *Cuvier*, *Regn. An.* ii., p. 349.
Anguilla acutirostris, *Yarr. Zool. Proc.*, 1831, pp. 133 and 159; *Zool. Journ.* iv., p. 469.
Sharp-nosed Eel, *Yarr. Brit. Fish.* ii., p. 284.

A diameter of the eye is comprised twice in the length of the snout, and stands over the corner of the mouth. Teeth, short, pointed, not much crowded, and forming from three to five irregular rows. Posterior vomerines running deeper into the mouth. Lips moderately developed. Pectorals almost as long as the mandible. The distance between the tip of the snout and the pectoral bears a proportion to the space between the pectoral and dorsal of 1 : $1\frac{1}{2}$.

Colour of the upper aspect, olive-green, dotted; of the ventral surface, brighter. Lateral line, raised, its pores forming shortly prominent white tubes.

A specimen from the Elbe measures 19·29 in. Its tail, 10·84 in. To the corner of the mouth, 0·75 in. To the pectoral, 2·44 in. To the dorsal, 5·91 in. Length of pectoral, 0·87 in.

A specimen of equal length with one of *latirostris*, exhibits the following differences:—

1. The eyes are smaller, and their diameter goes fully twice in the length of the snout. They lie also somewhat nearer to the forehead.
2. The forehead is 0·12 in. narrower.
3. The jaw is 0·197 in. narrower at the corner of the mouth.
4. The pectorals are 0·12 in. narrower.
5. And the lips are 0·079 in. thinner.
6. The teeth occupy a somewhat less breadth of surface; but the vomer is arched, and inwardly inclines more downwards.

This is the only species that we meet with in the German rivers and lakes; and it is, therefore, apparent that the German ichthyology does not enable one to decide respecting *latirostris* and *mediorostris*. If we are to find the *latirostris* in Germany, we must look for it in the mouths of the Elbe, since this species is partly a marine, partly a fresh-water one. Our doubts respecting the distinctness or identity of these eels are caused by want of materials for comparison.

β. African species.

78. Anguilla nilotica, fig. 28.

Anguilla nilotica, *Kaup*.

In a full-grown individual of this species the vomerine teeth reach as far back as the palatines, and in this respect it resembles the *A. Aucklandi* of Richardson (No. 91); but it differs from that eel in having the mandible longer than the snout. The moderately-big eye lies close to the forehead, and with its pupil directly over the corner of the mouth. Its diameter is comprised twice in the length of the snout. Pectoral somewhat longer than the mandible; and the dorsal not so high as that of *Aucklandi*. The distance between the tip of the snout and the pectoral is contained once and a half in the length of the space that intervenes between the pectoral and dorsal.

Colour of the upper aspect, greenish; of the under one, silvery. The sunken oblong scales are dotted with black. On the outside the pectorals are yellowish; and within, dark and dotted. Anal, yellowish.

This is a large eel. Total length, 21·42 in. Length of tail, 13·79 in. To the eye, 0·67 in. To the corner of the mouth, 0·95 in. To the pectoral, 3·23 in. To the dorsal, 7·68 in. Height near the beginning of the dorsal, 1·58 in. Length of the pectoral, 1·14 in. A specimen, not of the greatest size, measures 25·60 in., whereof the tail is 14·37 in.

Nile (Paris Mus. Geoffr. and Olivier).

79. Anguilla ægyptiaca.

Anguilla ægyptiaca, *Kaup*.

Eye placed with its pupil directly over the angle of the mouth, and having a diameter which measures half the length of the snout. Pectorals equal in length to the mandible, and measuring 0·87 in. The distance between the pectoral and the tip of the snout (= 2·76 in.) is to that between the pectoral and dorsal (= 3·15 in.) as 7 to 8, or it is comprised in the length of the latter once and a seventh. In the position and development of the teeth, the species resembles *acutirostris* and *nilotica*. Colour of the upper surface,

dark olive-green, with innumerable points; of the under surface, smutty white, with a silvery lustre.

Length, 20·67 in. Length of tail, 11·81 in.

Nile (Geoffroy St. Hilaire and Joannis).

80. Anguilla callensis.

Anguilla callensis, *Guichenot, Expl. Scient. Alg.* p. 111, pl. 7, f. 1, 1850.

This species also approaches very nigh to *acutirostris;* but the eye is not wholly over the corner of the mouth. In the comparative dimensions of parts there is also some discrepancy. The largest of five specimens measured as follows:—Total length, 17·32 in. Length of tail, 10·5 in. To the corner of the mouth, 0·51 in. To the pectoral, 1·97 in. To the dorsal, 5·20 in. Length of pectoral, 0·63 in.

According to M. Guichenot, this species, which varies much, abounds in the fresh waters of Calle, in Algeria.

81. Anguilla canariensis, fig. 29.

Anguilla canariensis, *Valenc.*

A moderately-elongated species, with pointed snout and very thin lips. The small eye stands over the corner of the mouth, and its diameter is contained twice in the length of the snout. The pectoral is somewhat longer than the mandible.

Palatine teeth disposed in two rows anteriorly, and in one posteriorly. Nasal bone and vomer armed by five rows of somewhat irregularly ranged teeth; the vomerines passing into two rows on the palate. Colour above, a dark olive tint, dotted with black. Belly and anal fin, yellowish-green.

Length, 20·08 in. Length of tail, 11·42 in. To the eye, 0·51 in. To the corner of the mouth, 1·10 in. To the pectoral, 2·52 in. To the dorsal, 6·70 in. Height at the pectoral, 0·98 in. Length of the pectoral, 0·83 in.*

* Peters describes the following African species:—

1. "Anguilla labiata, *flavo-viridis, nigro-marmorata, subtus sordidè alba; oculo mediocri, rostro obtuso; labiis crassis latis; dentibus in lateribus per series ternas vel quaternas dispositis; pinnæ pectorales in medio inter rostri apicem et pinnam dorsi positæ.*—Tette, Boror."
2. "Anguilla macrophthalma, *ex flavo virescens, fusco-viride marmorata, in lateribus aurea, subtus alba; pinnæ pectorales nigræ; pinnæ ani et dorsi albæ in margine nigro-virides; oculi permagni æneï; rostrum acutum, maxilla inferiore prominente, dentes in lateribus* uniseriales; *rictus parvus oculos non excedens; pinnæ pectorales sexta parte remotiores a pinnâ dorsali quam a rostri apice.* —Tette."
3. "Anguilla virescens, *fusco-viridis, in lateribus viridi-flavescens, subtus alba; rostro obtuso; pinnæ pectorales et anali rubescentes; pinnæ pectorales duplò remotiores* a pinnâ *dorsali quam ab apice rostri.*—Boror."
4. "Anguilla mosambica, *supra fusco-viridis, in lateribus ex viridi flavescens, subtus*

γ. Asiatic species.

82. Anguilla malgumora, fig. 30.

Anguilla malgumora, *Schlegel.*

The very large eye is placed, with its pupil, immediately over the corner of the mouth, and its diameter (= 0·394 in.) is contained once and three-tenths in the length of the snout (which is = 0·512 in.). Pectoral, measuring 1·06 in. and longer than the mandible, which measures no more than 0·83 in. The distance between the tip of the snout and the pectoral (= 2·83 in.) goes in the distance between the pectoral and dorsal (= 4·02 in.) once and five-twelfths.

This seems to be an eel which attains a large size, and has very distinct coarse scales. Its fins are duly developed. Colour on the upper aspect, olive-green; on the sides, silvery; and on the belly, yellowish-white.

Length, 22·84 in. Length of the tail, 13·39 in.

Borneo (Leyden Mus.; from the collection of Ed. and Jul. Verreaux, by whom the species was sent to me for description).

83. Anguilla celebesensis, fig. 31.

Anguilla celebesensis, *Kaup.*

This is a very stout, but short species, with jaws of equal length. Its eye stands before the corner of the mouth, and its diameter does not go altogether twice in the length of the snout; while the distance between the tip of the snout and the pectoral goes once and one-half in the length of the space between the pectoral and dorsal, whereby it is essentially distinguished from the *mova* of Bleeker, as well as by the breadth of the dental plates of the skull, covered with short teeth. As in *megastoma* (No. 99) the vomer, together with the nasal teeth, form a flat, spoon-shaped surface, the handle being farthest back.

Colour, bright olive-green, brighter on the under surface, and on the border of the duly developed dorsal fin.

Length, 26·78 in. Length of tail, 15·74 in. To the eye, 0·63 in. To the corner of the mouth, 0·95 in. To the pectoral, 3·07 in. To the dorsal, 7·18 in. Length of the pectoral, 1·14 in. Height near the pectoral, 1·38 in. Height near the anus, 1·89 in.

Celebes (? from the Tondan Sea).

alba; pinnæ pectoris et ani rubræ; pinnæ pectorales in medio inter rostri apicem et pinnam dorsalem positæ.—Lumbo."

This last species is the type of the genus *Tribranchus anguillaris* constructed from a monstrosity having three gills on one side.

84. Anguilla marmorata, fig. 32.

Anguilla marmorata, *Quoy & Gaim. Freyc. Voy.* p. 241.
Anguilla Elphistonei, *Sykes, Fish. of Deccan, Tr. Zool. Soc.* ii., p. 377, t. 67, f. 3, 1841; *Bleeker, Murænoiden.*
Muræna bengalensis, *Gray, Hardw. Ill. Ind. Zool.*
Anguilla variegata, *McClell. Calc. Journ.* v., 179, t. 5, f. 2.
Anguilla guttata, *Cuvier ex Voy. du Peron.*

This eel is widely distributed, since it is the one species which inhabits the whole of Hindostan, exists also in Java (*Bleeker*), in Waigiou, and Quawack (*Quoy and Gaimard*), Strong Island or Oualan, and Otaheite (*Lesson*), and Bourbon (*Paris Mus.*). It is easily distinguished from all the other known species by the speckled and marbled markings of its body, and by the dorsal fin standing broadly out over the anus. The distance from the tip of the snout to the pectoral is comprised once and eleven-fourteenths in the length of the space between the pectoral and dorsal. The vomerine and palatine teeth also form a crowded flat surface, becoming narrow and pointed backwards; while the moderately-large eye is only one-third of the length of the snout.

A large specimen in the Paris Museum possessing these characters must be considered to be a *marmorata*, though it has become totally black.

A specimen from Bourbon measures 18·90 in., of which the tail is 10·63 in. To the corner of the mouth, 0·79 in. To the pectoral, 2·76 in. To the dorsal, 4·92 in. Length of the pectoral, 0·79 in. According to Bleeker the species attains a length of 45 inches.

δ. American species.

85. Anguilla novæorleanensis, fig. 33.

Anguilla novæorleanensis, *Kaup.*

This species approaches the European *Anguilla Cuvieri* very closely, since it exhibits the same colouring, and the same large eye and short snout; but it is distinguished by the situation of the pupil behind the corner of the mouth, and by the pores of the lateral line being less obvious, since they are obscured by dark points.

On its upper aspect, this eel is dark olive-green; the belly and towards the lateral line being silvery. Dorsal, dark green. Anal, next the tail, greenish; towards the margin, yellowish, and finely dotted. Pectoral, on the outer side, yellowish-green, dotted with black; on the inner side, olive-green, with dark rays.

Length, 13·20 in. Length of tail, 7·88 in. To the eye, 0·28 in. To the corner of the mouth, 0·35 in. To the pectoral, 1·57 in. To the dorsal, 4·02 in. Height behind the pectoral, 0·67 in. Length of the pectoral, 0·59 in.

86. Anguilla tenuirostris, fig. 34.

Anguilla tenuirostris, *Dekay, Fauna of N. York*, 310. f. 173.
Anguilla vulgaris, *Mitchill, Tr. Lit. and Ph. Soc. of New York*, i., 360.
Muræna anguilla, *Schoepff, Beschr.* 8, p. 138.

The moderately-large roundish eye is placed with its anterior half over the corner of the mouth, and its diameter is not included quite twice in the length of the snout. Pectoral considerably developed, and longer than the mandible. In the length of the space between the pectoral and dorsal, the distance from the tip of the snout to the pectoral is contained once and a half.

Colour of the upper aspect, dark olive-green, and of the belly yellowish-white, separated from the dark upper tint by an indistinct silvery stripe. It is an abbreviated succinct marine eel, of which the French Museum obtained many examples from Messrs. Milbert and Richard.

Length, 22·84 in. Length of tail, 13·79 in. To the eye, 0·51 in. To the corner of the mouth, 0·79 in. To the pectoral, 2·99 in. To the dorsal, 7·68 in. Height near the pectoral, 1·38 in. Length of the pectoral, 1·10 in.

M. Deppe obtained a small specimen at Vera Cruz.

87. Anguilla punctatissima.

Anguilla punctatissima, *Kaup.*

This species was sent from Niagara to the French Museum by M. Milbert, and is of a slimmer make than the preceding one. The only specimen which I have seen exhibits a slight monstrosity in its snout being turned somewhat to the right side. Pupil of the eye situated over the corner of the mouth, and having a diameter which is comprehended once and a half in the length of the snout. The pectoral is a little longer than the mandible; and the distance from it to the tip of the mandible measures only half the space that lies between it and the dorsal fin.

Upper aspect, bluish olive-green. Pectoral, belly, and anal, yellowish. The entire body, with the exception of the belly, is besprinkled with innumerable minute points.

Length, 13·78 in. Length of tail, 8·27 in. To the eye, 0·28 in. To the corner of the mouth, 0·35 in. To the pectoral, 1·50 in. To the dorsal, 4·32 in. Height near the pectoral, 0·43 in. Length of the pectoral, 0·47 in.

88. Anguilla cubana.

Anguilla cubana, *Kaup.*

Although this eel, which was sent from Cuba by M. Morelet, resembles *tenuirostris*, it has a smaller eye, less full lips, and shorter pectorals. The small eye is placed with its larger anterior half

over the corner of the mouth; and its diameter is half the length of the snout. Pectoral scarcely perceptibly longer than the mandible, and the distance between it and the tip of the snout does not go quite twice in the length of the space between the pectoral and dorsal.

Upper surface, olive-green, with black dots on each scale; under one smutty white, without any silvery lustre. Surface of the pectoral next the body dark, dotted with black.

Total length, 17·32 in. Length of tail, 9·45 in. To the eye, 0·43 in. To the corner of the mouth, 0·63 in. To the pectoral, 2·36 in. To the dorsal, 6·11 in. Length of the pectoral, 0·59 in.

89. Anguilla novæterræ, fig. 35.

Anguilla novæterræ, *Kaup.*

Pupil of the moderate-sized eye placed over the corner of the mouth, its diameter bearing a proportion to the length of the snout of 1 : $1\frac{3}{4}$. Lips thin and little developed. It is a feebly-toothed species, having four rows of teeth in both jaws. The broad pectoral is longer than the mandible. Pores of the head unusually conspicuous. Scales on the head coarse and distinct, forming irregular transverse rings. Lateral line very distinct, except its pores, which have the same colour as the body, or olive-green. Belly lighter; but, like the body and fins, dotted with black. It is a moderately-elongated eel.

Total length, 21·06 in. Length of tail, 12·02 in. To the eye, 0·39 in. To the corner of the mouth, 0·59 in. To the pectoral, 2·36 in. To the dorsal, 6·62 in. Height behind the pectoral, 0·98 in. Length of the pectoral, 0·91 in.

Newfoundland (M. Despreaux).

90. Anguilla texana, fig. 36.

Anguilla texana, *Kaup.*

Diameter of the eye half the length of the moderately-pointed snout. The pupil situated over the corner of the mouth. The distance between the tip of the snout and the pectoral (= 2·76 in.) bears a proportion to the space between the pectoral and dorsal (= 4·53 in.) of 1 : $1\frac{9}{14}$.

In the only specimen known to me there is a slight monstrosity in the mandible crossing the point of the upper jaw by being bent to the left. Therefore I cannot say how much the pectoral is longer than the mandible, or whether the mandible is longer than the snout, though this is probable.

Colour of the upper surface, dark olive-green, stippled with a still darker tint; under surface, smutty white. Dorsal fin equally high from its commencement nearly to its end.

Total length, 23·64 in. Length of tail, 14·18 in. Length of pectoral, 1·06 in. Height close to the anal, 1·38 in.

Texas.

91. Anguilla wabashensis.

Anguilla wabashensis, *Kaup.*

Lips thin; vomer elongated, and set with teeth backwards to beneath the eye. Upper surface, greenish; ventral aspect, yellowish.

Total length, 30·92 in. Length of tail, 17·12 in. Distance from the tip of the snout to the dorsal fin, 10·63 in. From the tip of the mandible to the corner of the mouth, 0·91 in., or equal in length to the pectoral. From the tip of the snout to the eye, 0·63 in. To the gill-opening, 3·15 in.

Wabash, a tributary of the Ohio (M. Lesueur).

ε. *Australian species.*

92. Anguilla Aucklandi.

Anguilla Aucklandi, *Rich., Ereb. & Terr.* p. 113, pl. 45, f. 7–13.

Diagn. Upper jaw and mandible equal in length.

In this species the height of the body, and especially of the tail, is greater than in *australis;* and the end of the tail, with the fins spread out, is more rounded; the lips are less porous, and the tongue more pointed. The teeth also are disposed in narrower bands; and the vomerine patch tapers more, and runs further back. The most tangible difference, however, is in the origin of the dorsal, which is considerably farther forward. The eye also is placed rather before the corner of the mouth, not over it. The profile of the forehead is more concave.

Length of the fish, 20 in. To anus, 9 in. To gill-opening, 2½ in. To beginning of dorsal, 6·8 in. Distance between gill-opening and anus, 6½ in. The dorsal begins before the anus almost 2 in., or 4½ in. posterior to the gill-opening. (*Richardson.*)

Auckland Islands.

93. Anguilla labrosa.

Anguilla labrosa, *Rich., Ereb. & Terr.* p. 113.

The eel described below was taken by K. L. Sutherland, Esq., Paymaster and Purser of the "North Star," in the South Seas; but the exact locality is not recorded, and we do not know whether it be a fresh-water or marine fish. It has the general aspect of an eel, and also the conspicuous tessellated scales which many of the

true *Anguillæ* possess; but its dorsal, commencing rather nearer to the gill-opening than to the anus, excites a doubt as to whether it ought not to be classed with the Congers, which are artificially separated from the *Anguillæ* by the more anterior commencement of the dorsal. In the nature of the dentition, *labrosa* is allied to *Anguilla brevirostris* of McClelland (Calc. Journ. t. 5, f. 1), but the forms of the dental plates are not precisely the same.

The skin is clothed throughout, except on the lips, with narrow oblong scales, which taper considerably at one end; but are not absolutely acute. When examined with a microscope, their edges are perceived to be quite entire, and their whole disks to be densely studded with oval and rounded cells. *In situ* the scales are ranged in short rows, which meet each other nearly at right angles, and, being covered with a darker pigment than the dusky brown integument, are very conspicuous, giving a tessellated or interwoven appearance to the surface of the skin. The scales cover the fins, as well as the body and head. The head is depressed, flatly rounded on the top, and wider at the gill-openings than it is high. The compression of the body begins immediately behind the pectorals, and increases to the end of the tail, which, with its investing fins, is much rounded in the outline of the tip. The depression of the head augments to the end of the snout, which has very little vertical height, and is obtuse transversely; it nearly equals the lower jaw in length, and its breadth is augmented by thick scaleless lips, that can be made to stand out laterally like wings. In this position the breadth of a single lip is equal to three-fourths of the width of the snout, and it gradually narrows off to the corner of the mouth, just in the same proportion that the width of the jaw increases. The under jaw is furnished with a lip of similar shape and size, pierced by rows of large pores; and the scaly integument, ending abruptly at the bases of both lips, produces at first sight the appearance of an exterior lip; but there is not actually a distinct fold of the skin there. The short tubular anterior nostril is placed on the margin of the snout, just where the lip joins it, and the naked circular orifice of the posterior one is on a level with the upper margin of the orbit, and about one-third as far before it as the eye is distant from the anterior nostril. Eye small, and situated over the posterior third of the mouth, which is of the usual size in the *Anguillæ;* but small if compared with the *Congri.* The distance between the eyes equals the distance between the orbit and end of the snout, and is contained four times in the length of the head measured to the gill-opening. This last-mentioned measurement is three times and a half the length of the gape.

Vomerine and nasal teeth in one cluster, without any perceptible line of separation, forming a brush-like plate, which tapers to a point on the roof of the mouth, and does not extend so far back by one quarter as the palatines. The individual teeth are short, slender, cylindrical, and slightly recurved, with small, compressed, acute tips. The palatine bones are armed with a main series of

teeth, resembling those of the common Conger in being chisel-shaped and somewhat oblique at the tips, and, from their uniform height and close arrangement, fitting the series for an incisorial function. On the inside of this row there is a lower even range of more pointed teeth, whose tips are inclined inwards towards the mesial line. A deep smooth furrow separates the two rows. On the outside, close to the root of the main palatine series, there is a row of shorter acute teeth, resembling the nasal ones. Anteriorly these acute teeth increase in number to three or four deep on the outside, and also fill up the furrow between the principal rows, which there becomes wider, so that the fore end of the palatine bones presents a dental surface altogether similar to that of the nasal and vomerine bones; and the ends of the palatines, instead of articulating to the posterior edge of the nasal disk, as in the Congers, go forward to the end of the snout, flanking the nasal bone, on which they have a slight lateral motion, so that the line separating their dental surfaces can be traced. The mandibular teeth are like the palatine ones, and there are about nine teeth in the width of the dental surface near the symphysis.

The gill-openings are rather large; and the pectorals small and rounded. Their length about equals the distance from the posterior edge of the orbit to the end of the snout; and the dorsal commences at the distance of thrice the length of the pectoral from the gill-opening.

Length, 36 in. To anus, 16½ in. To gill-opening, 4·8 in. Height of body behind the pectoral, 3 in. Thickness, 2 in.

In *Anguilla brevirostris* the anterior interior palatine teeth are represented as forming an obtuse cluster on the side of the vomerine teeth. The dental plate, though wide anteriorly in *labrosa*, does not form the same lobe-like cluster, and the vomerine teeth taper more regularly and rapidly to an acute point. (*Richardson.*)

Pacific.

ζ. Species whose habitats are imperfectly known, the specimens not having been labelled as to their marine, lacustrine, or fluviatile origin.

94. Anguilla fasciata, fig. 37.

Anguilla fasciata, *Kaup.*

Diagn. Irregular black bands cross the body between the pectorals and dorsal. Three on the tail. A short eel, with pretty large eyes, situated over the corners of the mouth. The dorsal commences 2·05 in. before the anus. Lateral line elevated and porous.

This, so far as I know, is the only *Anguilla* which has black bands across the body. As in most of the species, the mandible is a little longer than the upper jaw.

Colour, dark greenish-brown, becoming yellowish on the under aspect.

Total length, 19·68 in. Length of tail, 11·03 in. To the gill-openings, 2·95 in. Length of the pectoral, 0·91 in. Height of the body, 1·57 in. Height of the dorsal fin, 0·43 in.

(Leyden Museum, ancient collection.)

95. ANGUILLA MACROPS, fig. 38.

Anguilla macrops, *Kaup.*

Diameter of the large eye contained once and a half in the length of the snout. Pupil placed directly over the corner of the mouth. Pectoral evidently longer than the mandible. By the distance between the tip of the snout and the pectoral being half of that between the pectoral and dorsal, the species is distinguished from the closely-resembling *malgumora* (No. 82).

Colour of the dorsal aspect, olive-green, with fine dark points, contrasting with the yellowish belly. Dorsal fin of the same tint with the back, but having a lighter border. Palatine teeth occupying narrow spaces; and the vomerines running backwards to the fore border of the eyes.

Total length, 22·05 in. Length of tail, 12·80 in. To the corner of the mouth, 0·67 in. To the pectoral, 2·48 in. To the dorsal, 7·29 in. Length of the pectoral, 0·83 in.

96. ANGUILLA ANGUSTIDENS, fig. 39.

Anguilla angustidens, *Kaup.*

The above specific appellation is given to this eel on account of the dental surfaces of its upper jaw being laterally pressed together. Eye large, and placed with its pupil over the corner of the mouth. Its diameter (= 0·276 in.) is contained once and five-sevenths in the length of the snout (= 0·473 in.). The pectoral (= 0·945 in.) is much longer than the mandible, measured to the corner of the mouth (= 0·630 in.). The distance between the tip of the snout and the pectoral (= 2·284 in.) is comprised once and seventeen-twenty-ninths in the length of the space between the pectoral and dorsal (= 3·623 in.). Dorsal fin very low.

Upper parts coloured dark olive-green, with innumerable points; under the lateral line, a silvery gray; while the belly and base of the pectoral exteriorly are yellowish. The outer surface of the pectorals is dotted with black, and their inner surface has the same tint with the back.

Total length, 18·50 in. Length of tail, 10·24 in. Height close to the pectoral, 1·02 in.

(Paris Museum.)

97. Anguilla eurylaema, fig. 40.

Anguilla eurylaema, *Kaup.*

Diameter of the eye comprehended once and three-fourths in the length of the snout. Pupil directly over the corner of the mouth. The elongated pectoral much exceeding the mandible in length. The distance between the tip of the snout and the pectoral is comprised nearly twice in that between the pectoral and dorsal. Near the corner of the mouth the palatine plates of teeth run out to a point, and the nasals and vomerines form a broad abbreviated plate, rounded off behind. Lips very wide.

Colour, yellowish-green; but more varied than usual in the eels, from the darkness of the transverse- and oblique-lying scales.

Total length, 23·24 in. Length of tail, 13·39 in. To the eye, 0·47 in. To the corner of the mouth, 0·71 in. To the pectoral, 2·72 in. To the dorsal, 7·68 in. Length of the pectoral, 1·10 in. Height of the body close to the pectoral, 1·34 in.

(Paris Museum.)

c. *Dental surfaces of the mouth very broad.*

98. Anguilla Delalandi, fig. 41.

Anguilla Delalandi, *Kaup.*

Delalande caught this remarkable eel in the Great Fish River of the Cape of Good Hope, and sent it to the *Jardin des Plantes*. In the size of the jaws and fashion of the dentition, it resembles greatly *megastoma* (No. 99); though its nasal teeth occupy a little less breadth, and those of the vomer do not contract so much into a narrow stalk-like prolongation. As in the *A. Aucklandi* (No. 92), the eye is situated before the corner of the mouth; but the dorsal fin reaches farther forward than in that species.

Total length, 37·03 in. Length of tail, 18·10 in. To the pectoral, 1·81 in. To the dorsal, 12·81 in. To the corner of the mouth, 1·73 in. To the eye, 1·22 in. Length of the pectoral, 1·89 in.

Muræna macrocephala, *Rapp*, *Wurzburgische Jahreshefte*, iv., p. 142 (Port Natal), may be cited doubtfully as a synonym of this species. It is at least a genuine eel, and nearly related to *Delalandi*.

99. Anguilla megastoma, fig. 42.

Anguilla megastoma, *Kaup.*

By the expedition of the Zelée, the Paris Museum received an eel from "Megarava" (? Mulgrave Archip.), which, from its innumerable long, pointed, card-like teeth, had been ranged alongside of

Delalandi. Its nasal and vomerine teeth form a flat spoon-shaped surface, with the handle towards the gullet. Toothless furrows separate the palatines from the nasals, and also the plates of the mandible at the symphysis. All the teeth are movable, pointed, the points bent, and turned flatly backwards. From 15 to 18 rows may be enumerated on the nasal bone. Head very flatly depressed, with the eye rather anterior. Fins duly developed. Colour, blackish-brown.

Total length, 35·45 in. Length of tail, 21·25 in. To the corner of the mouth, 1·73 in. To the eye, 1·02 in. Length of the pectoral, 1·22 in.

D. *Dorsal commencing behind, over, or a little before the anus.*

100. Anguilla Dussumieri, fig. 43.

Anguilla Dussumieri, *Kaup*.

This eel is distinguished from the rest of the Indian species, and from all others, by its dorsal commencing behind the anus. Its eye, of medium size, is situated before the corner of the mouth, and has a diameter equal to half the length of the snout, and the pectoral is somewhat shorter than the mandible. Head tolerably short and blunt anteriorly. In its dentition it resembles the others, except that the vomerine plate goes farther back towards the gullet than the palatines.

Colour above, olive-green, with a yellowish border to the dorsal; below, smutty white.

Total length, 20·88 in. Length of tail, 8·67 in. To the eye, 0·39 in. To the corner of the mouth, 0·79 in. To the pectoral, 2·76 in. To the dorsal, 9·06 in. Length of the pectoral, 0·67 in. Height close to the pectoral, 0·95 in.

Mahè, in Hindostan (*Dussumier*).

101. Anguilla mowa, fig. 44.

Anguilla mowa, *Bleeker, Muraenoiden et Verh. Bat. G.* xxiii., p. 22.

This eel resembles, in its colour and in the form of its dental surfaces, the preceding species; but is easily distinguished by its dorsal commencing over the anus. Eye placed over the corner of the mouth, and having a diameter rather exceeding half the length of the snout. From the eye forwards the snout is broad, flattish, and sloping to the sides. Mandible nearly equal in length to the upper jaw. This fish has a medium massive form, being less high than the preceding species.

Total length 17·31 in. Length of tail, 10·24 in. To the eye, 0·39 in. To the corner of the mouth, 0·59 in. To the pectoral,

2·17 in. To the dorsal, 7·09 in. Length of the pectoral, 0·79 in. Height close to the pectoral, 0·98 in.

Java (*Russell*, Leyden Museum).

102. Anguilla Bleekeri, fig. 45.

Anguilla Bleekeri, *Kaup.*

This resembles *mowa* in the dentition, the breadth of the mandible, and origin of the dorsal over the anus; but the head is flatter, the jaws wider, and the eyes are placed still farther forwards; the pectorals also are notably shorter. The dorsal commences 0·157 in. before the anus.

Dr. Bleeker says of his *Anguilla sidat* (No. 105) that it is distinguished from *mowa* by a higher body, and a specimen of *Bleekeri* of equal length has a decidedly slimmer form than *mowa*. *Sidat* resembles it in its short obtuse pectoral.

M. Leschenault transmitted two specimens to the Garden of Plants, omitting, however, to state whether they were from Java or from India.

Colour above, olive-green, with somewhat darker points. Anal fin, yellowish. Under parts, and the outside of the pectoral, whitish. The inner side of this fin is of the colour of the body, and has dark points.

Total length, 15·74 in. Length of tail, 8·86 in. To the eye, 0·39 in. To the corner of the mouth, 0·71 in. To the pectoral, 2·44 in. To the dorsal, 6·89 in. Height before the pectoral, 0·79 in. Height before the anus, 0·83 in. Length of the pectoral, 0·49 in.

103. Anguilla Cantori, fig. 46.

Anguilla Cantori, *Kaup.*

In its dorsal fin, commencing over the anus, this eel resembles the preceding species; but it differs in having a longer snout, exceeding somewhat twice the diameter of the eye. The vomerine teeth run farther back on the roof of the mouth than in most other species; but the breadth of the dental plates corresponds with that of the preceding species. The dorsal commences exactly over the anus. I have seen two specimens sent from Bombay by M. Dussumier. They are blackish above; lighter beneath.

Total length, 24·12 in. Length of tail, 14·18 in. To the eye, 0·51 in. To the corner of the mouth, 0·83 in. To the pectoral, 3·03 in. To the dorsal, 10·44 in. Length of the pectoral, 0·95 in. Height close to the pectoral, 1·14 in. Height to the anus, 1·22 in. Height in the middle of the tail, 1·38 in.

104. Anguilla malabarica, fig. 47.

Anguilla malabarica, *Kaup.*

Eye small, and placed the length of its whole diameter before

the corner of the mouth. Head very flatly depressed above the eyes, and unusually broad at the snout; in fact, in this species the snout is flatter than in any other. In the dentition of the cranial bones it resembles the preceding series. That which readily distinguishes it from *Cantori* and *mowa* is the dorsal originating half an inch before the anus.

Colour of the upper aspect, dark olive-green, with a yellowish edging to the dorsal fin. Under aspect, especially the anal fin, lighter.

Malabar (*M. Dussumier*).

Total length, 17·32 in. Length of tail, 10·05 in. To the eye, 0·47 in. To the corner of the mouth, 0·71 in. To the pectoral, 2·36 in. To the dorsal, 7·09 in. Length of the pectoral, 0·63 in.

105. Anguilla sidat.

Anguilla sidat, *Bleeker*, *Muræoiden*, p. 17.

Resembles *mowa;* but is distinguished from it by its higher body, broader snout, and shorter and more rounded pectoral fin, which latter is comprised three and a half times in the length of the head, as measured from the point of the snout to the gill-opening, or root of the fin. It has a higher body than *A. Bleekeri.*

Rays: Br. 12; D. 220-240; P. 17–18; A. 200–230; C. 10–12.

Java, in rivers and swamps; discovered by Bleeker.

106. Anguilla australis.

Anguilla australis, *Richardson*, *Zool. Trans.* iii., p. 157; *Ereb. & Terr.* 113, pl. 45, f. 7–13.
Anguilla nigro-punctata, *Cuv. Par. Mus. ex Voy. du Peron.*

This eel is proportionally a more slender species than *labrosa* (No. 93), and its lips, which have the same structure, are less thick and large. Its profile is depressed, or slightly concave, before the eye, and its snout rounded at the end. The eye is moderately large for an *Anguilla*, and is placed over the angle of the mouth. The anus is before the middle of the fish; and the distance between it and the gill-opening falls a little short of one-third of the whole length of the fish. The dorsal commences about the eighth of an inch before the vent, in the specimen here described, which is equal to a fifth or sixth part of the vertical height there. Minute delicate scales, arranged in the same lattice-work way as in *labrosa*, cover the entire integument of the body, head, and fins, the individual scales being oblong, oval, and more obtuse at one end; but not tapering so much towards the apex as in that species. Under the microscope the scales appear to be entire at the edges, and their disks show con-

centric rings of cells. The lateral line is a continued porous tube, and is conspicuous enough from the gill-opening to the end of the tail. The whole skin is perforated by innumerable minute raised pores, which are particularly conspicuous on the inside of the upper lip—the tongue and roof of the mouth looking, through a lens, like villi. Upper lip, as if fringed by pores, which terminate in a well-defined line running near the teeth. Dental surfaces of the several bones, slightly convex, and set densely in a villiform manner with short, slender, cylindrical, acute teeth, not ranged in definite rows. The dental surfaces are broadest at the symphyses of the jaws, and taper gradually towards the corners of the mouth. The palatine bones flank the nasal bone to the edge of the snout; and, owing to their lateral position and the rounded form of the snout, they do not run quite so far forward as the end of the nasal bone. The mandible is slightly longer than the upper jaw. Pectoral small.

Length of a Tasmanian specimen, 17·5 in. To anus, 7·5 in. To gill-opening, 2 in. Another specimen, from the Auckland Islands, measures 19 in. To anus, 8·6 in. To gill-opening, 2·4 in. And one from New Zealand, which was presented to the British Museum by Dr. Sinclair, Colonial Secretary, measures 18 in. in length, 8·2 in. to the anus, and 2·3 in. to the gill-opening. This example is proportionally thicker in the body, and its dorsal commences half an inch before the anus, which is farther forward than in the others. Its eyes are not symmetrically placed, the left one being over the corner of the mouth, and the right one a little farther forward; but its dentition corresponds with *australis*, and I can detect no specific differences. (*Richardson.*)

107. Anguilla Dieffenbachii.

Anguilla Dieffenbachii, *J. E. Gray, Dieffenbach's Travels in New Zealand, App.* p. 225; *Rich., Ereb. & Terr.* p. 113.

This eel has a larger pectoral than *australis*; and in a specimen 17 in. long, the dorsal begins an inch before the anus. On the head the pores are more distinct, and they are elevated on the lateral line. The lips are more developed than in *australis*, and the body is not so slender.

New Zealand (British Museum, by Dr. Dieffenbach).

A specimen in the Paris Museum has the dorsal extending a little farther forwards.

I have not been able to compare any of the *Apodes* of McClelland with the Indian species introduced into the preceding pages, since I found no specimens of his either in London or in Paris. This must, therefore, be my excuse if I have named as new any species already described by him.

Family II. MURÆNIDÆ.

For the most part of large size, destitute of pectorals, and having lateral slits for gill-openings.

Sub-Family I. MURÆNINÆ.

Uniserial teeth on almost all the dentiferous bones of the mouth.

Genus 26. MURÆNA. *L.*

Uniserial teeth on the nasal bone; 3 on the mesial line.

α. Uniserial vomerine teeth.

1. *Posterior nostrils shortly tubular.*

108. Muræna helena.

Muræna helena, *Linn.*; *Bloch*, t. 153; *Encycl. Meth.* t. 23, f. 79; *Rich., Ereb. & Terr.* p. 80, pl. 49, f. 1-6 (Australian specimen).
Muræna lentiginosa, *Jenyns*, *Beagle*, p. 143.
Muræna punctata, *Castelneau*, pl. 42, f. 3.

A species which is found in every sea, and is easily recognised by its posterior nostrils ending in short tubes.

Considerable variety exists in the shades of colour and in the size and distinctness of the spots in different examples of this fish from the same locality, much exceeding any peculiarity that could be detected on a careful comparison of the Australian specimen, (figured in plate 49 *Ereb. & Terr.*), with several others from Malta and Gibraltar.

The teeth are subulate, more or less compressed, and very acute, with thin, cutting edges towards the tip; the nasal teeth, however, and the anterior mandibular ones being considerably rounded in front towards the base. All are inclined backwards. The posterior nasal and adjoining palatine tooth are the tallest of the series; and these, with some of the neighbouring ones, and also a few on the mandible, have an acute notch on the posterior edge, with a slight basal lobe beneath it. Nasal teeth, about 12, exclusive of about 10 very short ones, alternating with them, but rather exterior to their bases, so that the marginal nasal teeth may be considered as making an approach to a biserial arrangement. Three teeth on the mesial line of the nasal disk, long, slender, and very

acute; the posterior pair being the tallest in the mouth. Eight or nine small, acute, uniserial vomerine teeth. Palatine teeth, about 10, uniserial. There are about 16 or 17 conspicuous teeth on each limb of the mandible, exclusive of small ones at the bases of the front teeth as on the nasal bone.

Eye moderately large, rather posterior to the middle of the rictus. The upper and lower jaw are bordered by a row of large pores, and there are also 6 on the tip of the snout. Vent, one twenty-fourth part of the whole length before the middle of the fish. Dorsal fin commencing before the gill-opening, gradually increasing in height until it attains its greatest elevation beyond the vent. Both it and the anal are conspicuous towards the tip of the tail, which is considerably compressed.

The ground colour of the fish is dark, or blackish brown, and is varied by white, oval, roundish, or irregular marks of various sizes, larger on the fore part of the fish, and so crowded on the head as to produce merely a brown and white mottling, becoming gradually smaller and more distinct posteriorly, and, towards the tip of the tail, arranged so as to produce a banded appearance. The white marks include oval and roundish blackish spots, generally darker than the ground colour. The throat and belly are pale, with a more minute mottling, and the folds of the throat, the corners of the mouth, and the gill-openings are black. Snout and lower jaw less spotted. The edges of the dorsal and anal are marked by a series of small white dots, most crowded on the anal, and the bases of these fins are spotted on each side by a less dense series.

The colours and spots of the Australian specimen described above, are extremely similar to those of one obtained at Gibraltar. Having had the skeleton of this latter one made, I ascertained, by repeated and careful enumeration, that the rays of the dorsal were 332, and of the anal 220, or 552 in all. The rays appear simple, and are without perceptible joints; but most of them can be split at the tips into two branchlets. There are 142 vertebræ, 71 of which are abdominal; but the anal fin extends forwards to the sixty-third. The air-bladder is oval, and about 1½ in. in length.

A second Gibraltar specimen differs slightly in the pale parts having a dilute orange tint, and in the mottling of the belly being more resolvable into spots, like those on the sides.

The British Museum possesses a variety from the Bay of Naples, in which the pale colour is reduced to roundish and angular white specks, about the size of a pin's head, placed at the corners of the black spots; and at first sight the fish appears to be dark liver-brown, speckled with white, but on a closer examination the figures of the dark spots may be traced. Towards the end of the tail, the whitish dots are arranged in vertical bars, five or six in each bar. The white specks on the edges of the fins are more remote than in the more common variety.

An example from Malta, in the Haslar Museum, has fewer and smaller white dots.

Rays: Br. 8; D. 332; A. 220 = 552 (Gibraltar specimen).
Rays: D. 323; A. 232 = 555 (Jamaica specimen).

	in.		in.
Length of two Australian examples	25	Gibraltar do.	30·0
Distance between snout and anus	12	,,	14·1
,, ,, gill-opening	2·86	,,	3·6

Hab. Mediterranean. English Channel. North African coast. Indian Ocean (*Bloch*). Australian Seas (*Richardson*).

Under the appellations of *M. brasiliensis* and *punctata*, Castelnean found Brazilian specimens in the Paris Museum which are besprinkled with yellowish dots of the size of pins' heads. I consider them to be a local variety of the common *M. helena*. (*Kaup.*)

109. Muræna vermicularis.

Muræna vermicularis, *Peters.*

In the form of the teeth, this species resembles *helena*: but its snout is more obtuse, and its head less compressed. The dorsal originates directly over the gills, and the anus is in the middle of the length, or a little before it, while the eye is over the middle of the gape. The dorsal exceeds the anal in depth, and is about equal to one-fifth of the height of the body. Colour, green; on the back, brown, with dark reticular marbled markings, which extend over the pectorals. Ground colour of the snout and chin, white, with dark-green spots and marbling.

Total length, 10·44 in. Diameter of the eye, 0·127 in. From the tip of the snout to the corner of the mouth, 0·47 in. To the gill-opening, 1·38 in. To the dorsal, 1·46 in. To the anus, 5·16 in.

Querimbo Isles. Ibo. Africa.

2. *Posterior nostrils not issuing in projecting tubes.*

110. Muræna nubila, fig. 48.

Muræna nubila, *Rich., Ereb. & Terr.* p. 81, pl. 46, f. 6–10.

Teeth uniserial, compressed-subulate, tapering, and very acute (or stiletto-shaped). Nasal teeth, 12, widely set and moderately tall, with a minute subulate one between each pair. Two teeth, placed well forward on the mesial line of the disk, the second one being the tallest in the mouth. Twelve conico-subulate, sharp-pointed, very short vomerine teeth, the anterior one standing a little out of line. Palatine teeth, 12, slightly reflex, the two anterior ones smaller than the rest, which diminish slightly in size from the third to the corner of the mouth. Mandible armed by

15 or 16 teeth on each limb, the anterior ones taller, more remote, and having one or two minute, subulate ones in their intervals.

The head of this species is considerably compressed, the jaws equal, and the snout obtuse, with a sloping profile, concave at the eye. The fold of skin which envelopes the dorsal is less thick than in many species, and rises suddenly, with little slope, about halfway between the eye and gill-opening. The fin continues high and very conspicuous throughout the back to near the end of the tail, where it narrows a little. The eye is rather large; the gape also large; and the distance from the tip of the snout to the gill-opening is about one-eighth of the whole length of the fish; while the anus is a fourteenth of that length before the middle of the fish. The usual pores exist on the snout and upper and lower lips; and the lateral line, consisting of a series of small pores, is sufficiently evident. Three black tapering streaks are conspicuous on the throat, the uppermost running back from the corner of the mouth. The body is marked by cloud-like spots, forming a series of irregular, and in some places, confluent bars. The spots commence on the lower part of the dorsal, and descend over two-thirds of the height. The ground colour is brownish on the back, and pale, or whitish, on the belly. The dorsal and anal are bordered by a well-defined, deep, black stripe, which is very narrowly edged exteriorly with white.

Cæcal stomach not reaching down to the anus. Pyloric orifice nearer to the gullet than to the point of the sac. Liver placed beneath and rather to the right of the stomach. An oblong, oval air-bladder lies behind the œsophagus. The spiral valve of the lower intestine was not made out, owing to the state of the parts.

Length of the specimen, 21·5 in. Distance between tip of the snout and the anus, 10 in. Distance from ditto to the gill-opening, 2·6 in.

This fish was obtained at Norfolk Island, by Dr. M'William, of the Royal Navy, Surgeon to the Board of Customs. A dried skin of a murrey, belonging to the British Museum, which was procured by Mr. Gilbert at Houtman's Abrolhos, is probably the same species, which, in that case, inhabits both coasts of Australia. The small intermediate teeth among the intermaxillaries do not exist in this latter example; and the larger ones have rounded, compressed posterior basal lobes not observable in the Norfolk Island specimen, being, perhaps, concealed by the soft parts; but there is no other remarkable difference in dentition. The anal has a whitish edge, surmounting a black stripe, and there are spots on the sides; but much defaced by the drying of the specimen. It measures 22 in. in length.

A third specimen, like the last, a dried one, and also existing in the British Museum, was prepared by Dr. Janvier at the Mauritius. It has the same dentition with the Norfolk Island fish, except that

a third tall tooth is present on the mesial line of the nasal disk; and, from the specimen being dried, the alternate arrangement of the vomerine teeth is perceptible, though they appear, on a cursory examination, to be in one series. Some of the spots or bars descend over the belly; and there are traces of six or seven black streaks on each side of the throat. Length, 44·3 in. To anus, 23 in. To gill-opening, 6·4 in.

Seas of Australia. The Mauritius.

111. Muræna schismatorhyncha.

Muræna schismatorhyncha, *Bleeker*, *Diagn. Beschr.*

Nasal bone, twice as long as it is broad, with 12-14 teeth, whereof 3 or 4, standing on the mesial line, are longer than the marginal ones. Palatine teeth, 27, unsymmetrically long and short. Vomerines, 13, conical. Mandibulars, 18, on each limb of the bone. Dorsal commencing before the gill-opening. Anal fin, embracing four-sevenths of the length of the fish. Colour, reddish-brown; the fins blackish, with yellowish borders. The jaws do not touch in the middle of the rictus.

Rays: Br. 12; D. 345; A. 200; C. 10.

Bencoolen. Sumatra (*Bleeker*).

112. Muræna sagenedota.

Muræna sagenedota, *Rich.*, *Ereb. & Terr.* p. 81.

The only example of this species which we have seen is a dried one in the British Museum, which was prepared by Dr. Janvier at the Mauritius.

There is considerable resemblance between it and *M. nubila*; but it appears to have a thicker body, particularly about the throat, while the vent is a little farther forward. The uniserial teeth are comparatively stouter, with less acute edges, and stand in a closer series both anteriorly and posteriorly. The highest on the edge of the upper jaw are the posterior nasal ones and adjoining palatines, whence they decrease gradually in both directions. Many of them have a minute notch near the middle of the anterior edge; and most have a conspicuous posterior basal lobe. There are about 19 between the symphysis and corner of the mouth on the upper jaw, and a corresponding number below, there being no small intermediate ones on the fore part of either jaw. The mesial teeth on the nasal disk are entirely absent in the specimen; and the disk itself is rather long and concave, without any pits. The vomerine teeth are minute, and do not exceed 3 in number. Eye moderate-sized, and rather before the middle of the gape of the mouth. Dorsal commencing about half-way between the corner of the mouth and the gill-opening. Anus as nearly as possible in the

middle of the fish. Distance between the tip of the snout and the gill-opening nearly one-seventh of the total length.

Ground colour of the dried skin, brownish, varied by 32 or 34 irregular, blackish vertical bars, which descend from the dorsal fin, and branch and anastomose about the gill-opening, so as to produce five or six meshes in the height, the bar-like arrangement not being perceptible there; more posteriorly the meshes are larger, and not above three or four in the height; at the anus they increase in size and diminish to two in the height; while towards the end of the tail the meshes are wholly superseded by bars. The areas throughout are traversed by fine dark lines, like veins in marble; and on the head and throat the mesh-like arrangement gives place to a fine mottling of the dark brown, with a paler colour in smaller quantity. No traces of this mottling are perceptible in any of the examples of *M. nubila*. In the specimen the dorsal fin ends abruptly about an inch from the point of the tail, the anal being perfect. The defect appears to have arisen from mutilation before death.

Length of the fish (dried), 41·50 in. From tip of snout to anus, 10·75 in. From ditto to gill-opening, 6·01 in.

Coasts of the Mauritius (*Richardson*).

113. Muræna reticulata, f. 49.

Muræna reticulata, *Cuvier*.
Gymnothorax reticulatus, *Bloch*, 416; *Syst.* 528.

Ground colour, pale honey-yellow, with from 20–33 dark, hair-brown bands, encircling the head, body, and fins. The intervals are about equal to the bands in breadth, and are marked with round brown dots, interspersed with many minute brown specks.

Teeth, compressed-subulate, disposed in a single series on both jaws. The nasal teeth, about 9, or more, in number, are a little more remote; and the palatine ones are more compressed, closer, more reflex, and diminish in size as they approach the corner of the mouth; but there is no sudden change in the series, either of form or height. The palatine teeth number about 10; and the series on the mandible corresponds generally with that of the upper jaw; The usual 3 mesial teeth exist on the nasal disk; and there are about 7 small, acute vomerine teeth in one row. When the teeth are examined with a lens, the maxillary ones, and those on the anterior part of the lower jaw, are seen to be minutely crenated towards the base posteriorly; and beneath the crenatures is a compressed rounded lobe, which is inserted into the gum.

Eye of moderate size. Snout obtuse. Profile full, slightly arched. Gape moderate. Dorsal commencing before the gill-opening. Throat plaited, distensible. Anus one-twelfth part of the whole length before the middle of the fish. The upper parts of the bands are formed of a close assemblage of dots and spots;

but the belly parts are homogeneous. The head and lower jaw are spotted with brown; the ground colour of the lower jaw and throat approaches to white; and three of the bands which belong to the nape and throat are less complete, being decomposed more or less into irregular spots. The intervals between the bands on the belly are nearly aurora-red; while the intervals on the dorsal and anal are white on the edge. The anal is banded like the dorsal; but not spotted as that fin is.

Length, 12·5 in. Distance between the tip of the snout and the anus, 5·5 in. Distance between ditto and the gill-opening, 1·5 in. (*Richardson.*)

Indian Ocean (*Bloch*). Sea of Borneo (*Sir E. Belcher*).

114. Muræna ocellata, f. 50.

Muræna ocellata, *Rich., Ereb. & Terr.* 82, pl. 47, f. 6–10.
Gymnothorax ocellatus, *Agassiz, Pisc. Bras. Spixii*, 91, t. L. 6, f. 6–9.
Murène pintade, *Quoy et Gaim. Freyc. Voy.* pl. 52, f. 2; *Jenyns, Voy. of Beagle*, 145.
Murænophis variegata, *Castelneau*, t. 42, f. 2.

Thickly studded, on the back and sides, by rounded and oval spots of various sizes, none of them exceeding a pea in magnitude.

The teeth, which stand in a single series on all the bones, are much compressed, with sharp edges, tapering and very acute, most of them finely serrated behind and before, the serratures being most readily seen near the base behind. The highest teeth stand on the palatines and fore part of the mandible, and they are there more widely set. On the palatines their outline is narrowly lanceolate, as are also the lateral ones on the mandible. The 3 mesial teeth exist, as usual, on the nasal disk, and they are serrated like the others; but they are scarcely so high as the front marginal teeth, and have been partly broken away in the specimen which we have figured (pl. 47, *Ereb. & Terr.*). The vomerine teeth, small and acute, are hidden by the soft parts.

This murrey has a blunt snout, a large eye, and a more than usually tapering tail, with a narrow tip. The dorsal commences a little before the gill-opening, and rises very gradually, but is not high anywhere. The position of the anus varies in different individuals. The specimen which is figured has the vent one-fourteenth part of the whole length before the middle; two others have it respectively at the twelfth and the nineteenth part. The lateral line, formed by a series of pores in the middle of the height, is conspicuous. The ground colour, after long maceration in spirits, is hair-brown, which, on close examination, is found to be produced by a minute reticulation of darker and paler lines. About 30 black spots on the dorsal, and 15 on the anal, alternate with white

marks. Towards the end of the tail the spots are larger, and form bars.

	Atl. spec.	2nd do.	Braz. spec.
Total length	17·5 in.	12·5 in.	19·5 in.
From snout to anus ...	7·5	5·5	9·25
,, gill-opening	2·35	1·42	2·58

Western side of North Atlantic Ocean. Coast of Brazil.

A murrey taken in the Gulf of Mexico by Assistant-Surgeon Rayner, of the Royal Navy, and presented to the Museum at Haslar, appears to be a slight variety of the above. It has the same form and dentition: but the spots on the body are much more numerous, and the fins, instead of being distinctly banded, have a continuous black edge, with a white stripe beneath it. The white stripe approaches the edge of the fin at intervals, so as to give it somewhat of a banded appearance when folded. Length, 15 in. Length from snout to vent, 7 in. Length from ditto to gill-opening, 1·9 in. (*Richardson.*)

Gulf of Mexico.

115. Muræna tristis.

Muræna tristis, *Kaup.*

Nasal teeth numbering 21, whereof 11 are long, and the rest short and alternating with the longer ones. On the mesial line there are 3 needle-shaped ones, which are the tallest. Palatines, 15, gradually diminishing in size posteriorly. On the vomer, 10 short, pointed teeth. On the mandible there are 20, of which the foremost three pairs overtop the others by half their height.

Head long. Diameter of the eye contained twice in the length of the snout. Front nostril tubes overpassing the lips. Dorsal moderately developed, and commencing on the occiput. Colour, black, with some indistinct yellowish-brown spots.

Total length, 14·97 in. Length of tail, 8·08 in.

Niger (British Museum. Fished by Mr. Frazer).

116. Muræna Richardsoni.

Muræna Richardsoni, *Bleeker, Murænoiden, &c.*

Nasal teeth, 8; on the mesial line, 1–3; 8 on the palatine bones: on the vomer, 14–16, some of them standing out of the row. Mandibulars, 12.

A moderately short-formed *Muræna*, with a short head and a somewhat swollen snout. Nostril tubes standing out above the lips. Diameter of the eye contained twice in the length of the snout. Dorsal commencing over the gills.

Total length, 8·86 in. Length of tail, 4·52 in.

Dr. Bleeker describes the colour as follows: Body, brownish-black, thickly crossed by obscure streaks or bands; fins, brownish-yellow, spotted with brown; the spots of the dorsal fin representing numerous bands, or short fillets.

Wahai, Ceram, and Padang, in the sea (*Bleeker*).

Borneo (British Museum. Leyden Museum one example).

117. Muræna similis.

Muræna similis, *Rich., Ereb. & Terr.* p. 83.
Species altera, &c. *J. R. Forster, Descr. An.* p. 183.
? Muræna Kidako, *Temm. & Schl. Fauna Jap.* 266, t. 117.

Colour, pale wood-brown, finely mottled with irregular star-like specks of dark hair-brown. The specks are scattered generally over the ground tint, and are also densely aggregated in patches, producing about 20 or more large spots, which run along the sides, and extend to the dorsal fin. A narrow line along the middle of the throat connects a series of the small specks, and the folds of the gill-membrane are traced on each side by similar lines. The anal fin is marked out by a black line, surmounted with a white edging. The dorsal is not so edged. Lining of the mouth, black, with yellowish bands, and mottled.

Nasal teeth, 10, moderately tall and very acute, with 3 taller and more slender teeth on the mesial line of the disk; succeeded by 8 or 9 short, acute vomerine teeth, standing in a single series. The palatine teeth, numbering 10–11, are also uniserial, and are reflex, and more closely set than the nasal ones; but not broad enough to be termed lanceolate: all are acutely two-edged towards the tips. The mandible is armed by 13 lateral teeth, similar to the nasal ones, but taller, also by 2 stoutly-subulate ones on each side near the symphysis, standing in the same row. A very small tooth precedes the first of these tall ones, and another intervenes between it and the following one.

The gape of the mouth is rather large, the eye moderately so, and the dorsal commences before the gill-opening (about half an inch in the specimen described). The anus is situated about one-sixteenth of the whole length before the middle of the fish.

Length, 24 in. To anus, 10·5 in. To gill-opening, 2·7 in.

Polynesia. Red Sea. Sea of Japan.

This *Muræna* has a pretty close resemblance to *M. variegata*: but the spots do not branch off in a radiated way, and the dentition is widely dissimilar. It agrees, in its large gape, sharp teeth, five parallel dark lines on the gill-membranes, and in colours, with the specimen obtained at Otaheite by Forster, and noticed after his account of *Echidna variegata*. It is probable that the native name of "Boohee" is restricted to this species, as the name of "Pipiro" only is written on George Forster's drawing of *M. variegata*. Rüp-

pell's plate of *M. ophis* has a still closer resemblance in colour and markings to *similis* than *variegata* has; but the shortness of the gape distinguishes *ophis* from the present species. The specimen in the British Museum, from which the above description was taken, is from Japan, and is marked "*Muræn. ophis*, Faun. Jap." Not knowing what appellation the authors of the *Fauna Japonica* mean to give it, I have termed it *similis*, to denote its general close resemblance to *variegata* and *ophis*. I would gladly have adopted Forster's name *echidna* as a specific appellation for this species; but it has been applied by Schneider to *variegata*, and would lead to confusion if used to designate another species. Lacepede's *Muræn. echidna*, which, he says, has a very large gape, bristling with many teeth, cannot be *variegata*. He refers to Ellis, in Cook's third voyage, as his authority; but on turning to that work I find only the following sentence: "Amongst these were some large eels, beautifully spotted, which, when followed, would raise themselves out of the water and endeavour, with an open mouth, to bite their pursuers." (*Voy. to Pacif. by Capt. Cook, Clerke, and Gore*, 1776–80, vol. i., p. 219. Lond. 1784.) (*Richardson.*)

118. Muræna punctata.

Muræna punctata, *Rich., Ereb. & Terr.* 83.
Gymnothorax punctatus, *Bloch, Sch. Syst.* 526.
Calamaia paum, *Russ.* xxxii.

Diagn. Ground colour, brown, with numerous irregular yellowish spots.

A dried, overstuffed, and not quite perfect specimen of a *Muræna* exists in the British Museum, which possesses the characters ascribed by Schneider to *punctata*.* It was purchased from a dealer, and its place of capture cannot be ascertained. Russell's figure is a pretty good representation of the fish.

Teeth in a single series on the several bones. On the border of the nasal bone there are 14, which are compressed, with acute edges and points. Three tall, subulate, slender ones on the mesial line of the disk, and 5 short, slender, and very acute ones on the line of the vomer, the series commencing at some distance from the nasal disk. Ten or eleven on each palatine bone, shorter and scarcely wider than the nasal ones, reflex, more closely set, and diminishing in size towards the corner of the mouth. Eleven or twelve lateral teeth on the mandible, closely set, equal in size, compressed, acute, and reflex, with 2 much stouter and a little taller, widely set in the same series on each side of the symphysis.

* Schneider's account of the species is, "*Gymn. punctatus*, (*Dentium palatinorum [illegible] corpore exceptum, colore brunneo, maculis parvis aurantiacis, ocellibus, limbo brunneo, pinnâ dorsi ante spiracula exortâ, rictu angustiore antecedentibus, [illegible], maculis majoribus longiore. Longus 2¼ ped. Variat punctis flavis; b. punctis et maculis brunneis.*"

Eye rather large, over the middle of the gape of the mouth, which is of moderate size. Nose straight, with the hinder part of the head apparently rising suddenly. Dorsal commencing a little before the gill-opening. Anus, in the dried specimen, very little before the middle of the fish.

In the spotting, this *Muræna* most resembles *paronina*; but the spots are smaller, more numerous, and less regular, several of them in various parts being oblong. They have their borders similarly darkened, are about the size of partridge-shot, and are pretty regularly scattered over the head, body, belly, and fins; towards the top of the tail they are smaller and less crowded. The rays of the dorsal are short at the commencement, and increase gradually to opposite the vent, where they are, in the specimen here described, about an inch long, and they lose little of their length till within three inches of the tip of the tail.

Length, 34·25 in. Distance from tip of snout to anus, 16·75 in. Distance from ditto to gill-opening, 4·2 in.

Indian Ocean.

119. Muræna pseudothyrsoidea.

Muræna pseudothyrsoidea, *Bleeker, Mur. et Synbranch.*
Muræna de Coromandel, *Leschenault* (*Paris Museum*).

As the name plainly indicates, this *Muræna* very much resembles the *Thyrsoidea* of Richardson; but it cannot be mistaken for that species, which belongs to a totally different group.

In shape it is of medium length. The gape is moderately wide, the fore-nostril tubes do not project beyond the border of the lip, and the hinder nostrils are small points opening above the fore-angle of the eye. In all there are 12 nasal teeth, the fourth on each side being small. Palatine teeth, 10–12, the fore ones the longest. Vomerine teeth, 6–7, very small and pointed. Mandibulars, 19–22, the 8 fore ones being the longest.

Dorsal commencing behind the head. Tail shorter than the body. Whole body blackish, with a fine, irregular, yellowish-brown reticulation. Round the gill-openings, and at the corner of the mouth, black.

Length of body, 11·12 in. Length of tail, 9·06 in. To the gill-opening, 0·32 in.

Macassar (*Bleeker*); Bombay (*Dussumier*); Pondicherry (*Leschenault*).

120. Muræna mauritiana.

Muræna mauritiana, *Kaup* (*Paris Museum*).

Has a short, obtuse head, and narrow gape, with very short anterior nostril-tubes, and the posterior ones situated over the fore

corner of the eye, and destitute of a distinct border. Nasal teeth longer than the others, and 10 in number, with 3 minute ones among them: 2 on the mesial line. Vomerines, 6–7, very small and acute. Palatine teeth, 9, the longest of them situated below the eyes. Mandibular teeth, 15, the 6 anterior ones tallest; the middle ones on the symphysis are, like the middle nasal ones, the shortest. Dorsal fin, pretty high, commencing before the gills. Colour, generally blackish, with some brown dots and markings. A fine yellowish edging surrounds the tip of the tail.

Length from tip of the snout to the anus, 8·27 in. Length of tail, 9·85 in. To the corner of the mouth, 0·83 in. To the gill-opening, 1·81 in.

A younger specimen, from the Isle of Bourbon, has more distinct yellowish-brown spots on the body.

From the Mauritius and Isle of Bourbon.

121. Muræna nigrolineata.

Muræna nigrolineata, *Kaup.*

Nasal teeth, 12; on the mesial line, 3; palatines, 12, whereof the first and second are small, the third, fourth, and fifth are the longest, and the remaining ones decrease gradually towards the corner of the mouth. On each limb of the mandible, 23, of which the foremost 3 are the biggest. On the vomer there are traces merely of 2 very small teeth. Anterior nostril-tubes projecting above the lip; small hinder nostrils, oblong, and situated above the fore corner of the eye. Dorsal fin, high, commencing on the occiput.

A moderately-elongated *Muræna*, which resembles *unicolor* (No. 164) of the group *Thyrsoidea*.

The colour, which has suffered from maceration in spirits, is dark, with innumerable oblique lines that run into each other, and are interrupted.

Total length, 19·29 in. Length of tail, 9·45 in. To the corner of the mouth, 1·10 in. To the gills, 2·36 in.

Marquesas Islands (Paris Museum).

122. Muræna marmorea.

Murænophis marmoreus, *Valenc. Venus*, pl. 14, § 1.

Body yellowish-brown, with black reticulations, whose longitudinal branching streaks are studded with oblong yellow spots. On the ventral aspect the spots are larger, rounder, and near the throat coalescent. The dorsal fin is of an even height, begins behind the head, and is yellowish-brown, with black spots. Teeth, 10 on the border of the nasal bone, 3 on the mesial line; 13 palatines; 10 vomerines; and 18 mandibulars.

A stuffed specimen obtained by Fremenville, on the expedition

of Admiral Dupetit-Thouars, is preserved in the Paris Museum. It is 20·86 in. long, and its tail measures 11·42 in.

Galapagos.

123. Muræna flavimarginata.

Muræna flavimarginata, *Kaup.*

The Paris Museum possesses two skins, which, at the first glance, appear to be different, but on a closer examination, are found to be varieties of one and the same species; both were sent by M. Nigou from the island of Bourbon. Fins black, speckled with yellow. A black stripe runs from the throat to the anus. Whole body spotted with yellow.

The paler variety is nearly of one yellowish-brown tint, and has no vomerine teeth, while the darker variety has 2 rudimentary ones standing obliquely in the front of the vomer, which may readily drop out during life. On the nasal bone, 12 teeth. On the palatines, 7–8. On the mandible, 14–16, ranging up to the symphysis. The whole head is finely spotted, and the occiput, near its vertex, is crossed by interrupted lines that run into one another. The markings on the tail are irregular cross stripes, which are remote from each other.

The darker variety has coarser markings that are more distinctly separated. On the head, the spots do not form cross lines, and are larger.

124. Muræna elegantissima.

Muræna elegantissima, *Kaup.*

Nasal teeth, 13; on the mesial line, 1; vomerines, 9; palatines, 10; mandibulars, 17. The solitary tooth on the mesial line is short and obtuse. Two pairs stand in a transverse straight line on the front of the mandible, separated by the symphysis, and there is an inner pair next them. Form not much elongated. Snout slightly swollen. Anterior nostril-tube reaching over the lips. Posterior nostrils opening backwards. Dorsal commencing over the gills. Body and fins covered with a yellowish-brown network, enclosing three rows of irregular dark spots, having black centres. Under surface, yellowish, spotted with black.

Length of body, 3·86 in. Length of tail, 4·25 in.

? Australia (Paris Museum. Exp. of the Astrolabe).

125. Muræna interrupta, fig. 51.

Muræna interrupta, *Kaup.*

Nasal teeth, 12, pointed; 2 on the mesial line; palatines, 11, the first 3 the tallest; mandibulars, 25, the foremost 6 longer, the remaining ones very small. Front nasal tubes reaching over the edge of the lip. Hinder nostrils situated above the fore edge of the eye, small, and bordered with white. Head and body embraced by 21 black bands, which become suddenly narrower towards the belly, and near the throat do not go quite round. Two white spots,

and one black one, exist on the edge of the dorsal in each interval of the bands.

Total length, 17·32 in. Length of tail, 9·06 in.

Red Sea (*Clot Bey*).

126. Muræna python, fig. 52.

Muræna python, *Kaup.* (*British Museum*).

Is one of the largest of the entire family. Colour, black, with a handsome yellow network spread over the whole body, separating the black tint into irregularly round spots, very different from the spots and bands of *Pacilophis catenatus* (No. 175). On each side of the throat, there are about 15–16 spots, and near the tail 8–9. In *Thyrsoidea isingleena*, the spots are less numerous, more bean-shaped, and the meshes of the network are neither so regular nor so equally broad.

Total length, 45·29 in. Length of tail, 20·86 in.

Africa (British Museum, by Mr. Nimmo).

127. Muræna venosa.

Muræna venosa, *Kaup.*

On the whole nasal bone, 8 teeth; on each palate bone, 8; on the mandible, 8, all pretty long, and curved backwards; vomerines, 6, short and obtuse. A large specimen wants teeth on the mesial line; but, in a young individual, there is a single tooth under the integument. Front nostril-tubes reaching beyond the lips. Diameter of the eye contained nearly twice in the length of the snout. Dorsal commencing nearly at the occiput. The young specimen has the pores irregularly encircled with white, and the head dotted and marked by lighter-coloured star-like specks. Dorsal not distinctly spotted.

Total length, 12·65 in. Length of tail, 6·50 in.

Timor. (Two spec. in Leyden Museum.)

β. Biserial vomerine teeth.

128. Muræna favaginea, fig. 53.

Muræna favaginea, *Cur.*
Gymnothorax faviginea, *Bloch, Schn. Syst.* 525, t. 105.
Thærodontis reticulatus, *M'Clell. Calc. Journ.*, July, 1854.

Nasal teeth, 12; on the mesial line, 3; palatines, 10; vomerines, 11–12; mandibulars, 18, of which the foremost 5 are the longest. Between the second and third fore ones, there is a little toothlet which is easily overlooked. Cuvier ranks this species among those which have uniserial vomerines, while M'Clelland describes the vomerine teeth as biserial. In a specimen sent from Malabar, by Dussumier, and preserved in spirits, I could perceive only a single

row of 10–12 teeth in the middle of the vomer. Another, a stuffed one sent from Pondicherry, by Leschenault, shows two distinct rows which, towards the gullet, run into one series. I consider two rows of vomerines to be the normal number. These unusual deviations struck me the more strongly because I had held such to be of sufficient importance to furnish characters for a lesser group. I compared, therefore, both specimens with the greatest care, but I could not find reasons for separating them specifically. Both have the rest of the teeth perfectly alike, both have the same markings enclosed in a whitish-coloured net-work, which encircles about six black spots on the flanks. Tail and trunk of equal length.

Total length, 28·26 in. Length of tail, 14·18 in. To the gill-opening, 3·78 in. Length of the jaws, 1·69 in.

Asia. Hindostan.

129. Muræna tigrina.

Muræna tigrina, *Rüppell, Atlas*, t. 30, f. 2.

Dr. Rüppell, in the account of his travels, describes a young specimen of this *Muræna*, and in the Paris Museum, I found a skin of the same which was sent from the Red Sea by M. Botta. It presents 12 long arched nasal teeth, with small ones between them; 3 on the mesial line; palatines, 17, the longest of which are situated under the eye; mandibulars, 20, and 6 larger ones in front, whereof 2, placed at the symphysis, are shorter and bluntly conical; vomerines, 9 in the left-hand row, 5 on the right-hand one; the rows uniting posteriorly. Along the tail there are three rows of black spots, as described by Rüppell, but there are also, as an old individual distinctly shows, a large number of big spots on the throat.

130. Muræna Mulleri, fig. 54.

Nasal teeth, 12; palatines, 11–12; mandibulars, 22, all pretty well developed; vomerines, 12, short, conical, and rather obtuse, disposed in an irregular row, in some places two-ranked. This species comes near to *M. similis* (No. 117), but differs in having 22 teeth on the mandible, and also in its colour and markings. Eye round, pretty large, contained twice and a little more in the length of the elongated snout, and more remote from the tip of the latter than from the angle of the mouth. Dorsal originating before the gill-opening. Colour of the body dull brown, lighter on the lower parts; behind and below the eye irregularly spotted with white. Pores of the upper jaw, and mandible, bordered with white. This species is named after the renowned traveller, Dr. S. Müller.

Malayan Archipelago (Leyden Museum).

131. Muræna Troscheli.

Muræna Troscheli, *Bleeker, Murænoiden, &c.*

Nasal teeth, 10–12; 1–2 on the mesial line; palatines, 9; vomerines, 18, in two rows; mandibulars, 15. Dorsal commencing before the gills. Anus in the mid-length. Height of the body, one-twentieth of the length. Snout, convex, pointed, not quite twice the length of the eye. Bleeker describes the colour of the body, and fins as dark brown, reticulated and somewhat marbled by yellowish-green.

Rays: D. 318; A. 225; C. 12.

Total length, 6·89 in.

Sumatra (*Bleeker*).

132. Muræna chrysops.

Muræna chrysops, *Kaup* (*Paris Museum*).

Nasal teeth, 7, with a short one at the symphysis; none on the mesial line, having, perhaps, been broken away. Palatines, 8; vomerines, 9, very short, and forming an irregular row; mandibulars, 12.

A rather slender *Muræna*, with a pretty sharply pointed tail. Snout considerably obtuse, and containing the length of the diameter of the eye once and three-quarters. The anterior nostril-tubes reach beyond the lips, and the dorsal commences over the gills. Upper parts black, with yellowish-brown stars and star-like figures. Lips and mandible yellowish-brown, with black zigzag markings.

Total length, 9·38 in. Length of tail, 4·92 in.

Otaheite (one spec. sent by M. Dubois).

Genus 27. SIDERA, *Kaup.*

Only one conical tooth on the mesial line. Vomerines, short, granular, in two rows, which unite in a point posteriorly. Gape, not opening very widely. The species have dotted skins.

a. Nasals uniserial; mandibulars, at the symphysis, biserial.

133. Sidera Pfeifferi.

Muræna Pfeifferi, *Bleeker, Add. zu Muræn.*

Nasal teeth, 12; palatines, 12, pointed and compressed; vomerines, 20–22; mandibulars, 18–20 in the outer row, 2 in the inner row towards the front. Snout convex, less than double the length of the eye, having 3-4 pores on each side, near the eye. Dorsal fin commencing scarcely before the gill opening. Anal originating in the fore-half of the fish. Bleeker gives the following descrip-

tion of the colour: Upper aspect of the body, together with the dorsal fin, violet-blue, reticulated, and veined by yellow or orange; anal fin and under aspect violet-blue, with small, crowded, variously-shaped yellow or orange spots.

Rays: D. 312; A. 210; C. 10.

Length, 15·86-20·64 in.

Ceram. Macassar. Celebes.

β. Nasals, biserial; mandibulars, uniserial.

134. Sidera pantherina.

Muræophis pantherine, *Lacep.* t. v., 641.
Muræna picta, *Thunberg*, 7, t. i., f. 2.
Muræna atomaria, *Sol.*
Muræna pratbernon, *Quoy & Gaim. Voy. du Freyc.* pl. 52, f. 1; *Rich., Ereb. & Terr.* 84.
Muræna siderea et lita, *Rich., Ereb. & Terr.* 84, 85, pl. 48, f. 1-5.

Lacepede and Thunberg were the first who described and figured this *Muræna*. Lacepede's specimen, which is still in the Paris Museum, is a young fish, and the spots on the skin are less numerous than in older individuals. In place of the five rows of spots that are well expressed in Richardson's figure, the young fish is marked by small roundish or irregularly-indented spots, margined with black, which, sometimes on one, sometimes on the other side, are open, or merely encircled by black points. The under aspect is, down to the anus, yellowish, without spots. In advanced age the under surface continues lighter; but it becomes spotted.

In the dark variety, *pratbernon* and *lita*, the black colour predominates on the upper parts; and the lighter colour is reduced to fine zigzag lines, which form all manner of figures. This dark variety also exhibits at times the same longitudinal rows of round spots which show in the lighter variety that Richardson has described under the name of *siderea*. In some examples of this yellowish variety one can perceive no traces of the round spots.

Australia (*Richardson*). Darnley Island (British Museum, *Jukes, Quoy & Gaim.*). Diego Gracias (*Bosk*). Strong Island (*Lesson*). New Guinea (*Richardson*). Moluccas (Berlin Museum).

Sub-Family II. THYRSODEINÆ.

On the palatine bones there is, behind the outer row of teeth, a second rank, which varies extremely in its numbers.*

At the head of this family I place a most singular form, which is very evidently different from all the other *Thyrsodeinæ*.

* In a small number the inner teeth are wanting occasionally, and it is necessary to examine a large suite of specimens to avoid mistake.

Genus 28. ENCHELYNASSA, *Kaup.*

Fore nostril, funnel-shaped, and capable of being shut up by a valvular elongation of its hinder border. Hinder nostril, nearly as big as the eye, oval, with a raised border. Rictus of the jaws open in the middle.

Nasal bone, reaching as far back as the middle of the eye, armed with 27 teeth on its circumference, a pairless one in the middle, and 5 longer ones, between the second and third of which stand 3–4 small ones, between the third and fourth 4 small ones, and between the fourth and fifth 1 small one. Palatines, 16, whereof the second onwards to the sixth are supported before and behind by small teeth; on the inner row there are 9 longer acicular teeth. On the mesial line, 3. On the vomerine I could discover no more than 2 small conical toothlets. Mandibulars, 22 smaller ones in the outer, and 6–8 longer in the inner row, approximated to the symphysis. The eyes are situated above the middle of the jaws. There are four pores on the upper jaw and mandible, which are difficult to find in the porous skin.

135. Enchelynassa Bleekeri, fig. 55.

Enchelynassa Bleekeri, *Kaup.*

This species attains a notable size. The female specimen in the ancient collection of Leyden has a length of 28·36 in., whereof the tail constitutes 14·18 in. From the tip of the snout to the raised border of the funnel-shaped gill-opening, 3·84 in. At the gills the body is 2·21 in. high.

Although this specimen has been immersed in spirits above a hundred years, it has been so splendidly preserved, even to this day, that the body and dorsal fin are ornamented by oblique zigzags, interrupted transverse lines, and innumerable black points, on a brownish ground. I found in its stomach a well-preserved *Holocentrum punctatissimum* (*Cuv. & Valenc.*), and thence infer that this *Enchelynassa* is an inhabitant of the Pacific Sea. I have received also a slight sketch of this fish from my valued friend, Dr. Bleeker, and have named the species in honour of his high ichthyological reputation.

Genus 29. EURYMYCTERA, *Kaup.*

The tube of the fore nostril stretches considerably beyond the lips, and its tip is dilated above and below. Posterior nostril surrounded by a funnel-formed border, and situated before the eye. Nasal teeth, 11, with 5 small ones between the 4 hinder ones. Palatines, 30; an inner row of 5 taller ones beginning under the eye. Vomerines, about 7–10, extremely small and difficult to dis-

cover. Mandibulars, about 27, with 5 bigger ones, forming an inner row near the symphysis. Four pores on the upper lip, and one on the mandible. Moderately distinct pores on the lateral line. Head slender; jaws cleft far back. Dorsal fin commencing on the occiput.

136. Eurymyctera crudelis, fig. 56.

Eurymyctera crudelis, *Kaup*.

Skin having a leathery tint. Dorsal fin darker near the border, and edged with white. Throat and belly brighter. Length of body, 8·27 in. Length of tail, 8·66 in. To the corner of the mouth, 1·10 in. To the gills, 1·73 in.

Java (Leyden Museum. Two specimens from Kuhl and Von Hasselt).

Genus 30. ENCHELYCORE, *Kaup*.

The widely-cleft jaws (as is the case likewise in *Enchylynassa*) cannot close on account of the length of the teeth. The hinder nostril is also big, is situated before the eye, is longer than it is broad, and measures from half to three-fourths of the diameter of the eye, while the fore nostril-tube is unusually short, does not project beyond the lip, and is not furnished with a lid. The eye is situated in the middle of the snout, and the slender mandible is somewhat curved upwards at the end. On the outer border of the nasal bone there are 24 fine teeth, whereof only the first, sixth, and tenth are elongated; 8 longer movable ones in the second row, equalling in height the 3 on the mesial line. Palatines, 18, with 3 bigger ones; in the second row, 5 big movable ones. Vomerines, 15–16, small and pointed. Mandibulars, 37, the foremost 2 bigger, the others fine; in the second row, near the symphysis, 2 bigger, movable teeth.

137. Enchelycore eurythina.

Enchelycore eurythina, *Kaup*.

Dorsal beginning indistinctly over the gills. A black longitudinal stripe on the throat. The rest of the colouring cannot be made out.

Entire length, 23·63 in. Length of tail, 11·82 in.

Country unknown (Paris Museum. Two examples).

Genus 31. THYRSOIDEA, *Kaup*.

This considerable group conforms to the *Muræna* in the form of the fore and hinder nostrils; but is separated from the true

Muræna by the presence of a more or less complete inner row of pointed teeth on the palate bones. On account of the number of the species, it is convenient to divide them into separate minor groups by the differences of their dentition.

α. *Nasals and vomerines uniserial.*

1. *Reticulated markings.*

138. Thyrsoidea macrops.

Thyrsoidea macrops, *Kaup.*

Nasal teeth, 14 in all; 3 on the mesial line. Palatines, 9 in the outer row, 1 in the inner one. Vomerines, 13, moderately short and blunt. Mandibulars, 16, two pairs on the inner side, near the symphysis.

Head elongated, with a moderately pointed snout. Eye large, placed above the middle of the jaws; its diameter comprised once and a half in the length of the snout. Dorsal commencing close to the occiput. Tail longer than the trunk of the body. Fore nostril-tube reaching over the lips. Total length, 7·48 in. Length of tail, 4·26 in. Colour, yellowish, with irregular dark brown cross bands, and betwixt the bands angular spots, with pale borders.

139. Thyrsoidea isingleenoides.

Muræna isingleenoides, *Bleeker*, *Muræoiden.*

Nasal teeth, 8; 2 on the mesial line. Palatines, 12 in the outer, 2–3 in the inner row. Vomerines, 8, conical and pointed. Mandibulars, 18, the foremost being the largest.

Snout convex, nearly twice the length of the diameter of the eye. Dorsal beginning before the gills. Anus in the middle of the length. Colour, greenish brown, with numerous oblong and round irregularly-scattered black spots. Brown longitudinal stripes on the cheeks. Rays: D. 350; A. 270; C. 10.

Total length, 7·48 in. to 10·63 in.

Sumatra (*Bleeker*).

140. Thyrsoidea griseo-badia.

Muræna griseo-badia, *Rich.*, *Ereb & Terr.* 89.

One row of close-set, conico-subulate, nasal teeth, 14 or 16 in number, the 4 posterior ones on each side bent backwards at their middles. Two tall, slightly-recurved, moderately-acute teeth on the mesial line; *and about* 11 *small, round, and obtuse vomerine*

teeth in one row, but 2 of them standing a little out of line. Palatine teeth biserial; the outer row composed of 14 close-set, low, even, *bluntish teeth*; the inner one of 11 taller, more distant, slenderly-subulate, but not very acute teeth. Fore half of the mandible armed by two rows of teeth; the outer row consisting of 10 or 11 close-set low teeth, having compressed but not pointed tips; the inner row of 5 or 6 taller ones, of which the 2 or 3 posterior ones are bent back and are more acute. The posterior half of the jaw is set with low, bluntish teeth, alternating with others a little taller, somewhat recurved, and standing a little within; but the two sets are so close, that until very narrowly examined, they appear to form one uneven row.

A slender species. Under jaw shorter than the upper one. Anus exactly in the middle of the length. Colour, liver-brown, finely reticulated by grayish-white lines, forming small meshes, which are roundish near the head, and squarish elsewhere; but they are not very visible, unless when examined with the aid of a lens, the general tint appearing to the naked eye grayish-brown.

Length, 6·2 in. Distance between the end of the snout and the anus, 3·1 in. Distance from ditto to gill-opening, 0·73 in.

Tonga Islands (*Dr. M'William*).

The only spotless *Muræna*, mentioned in Solander's notes of the fish observed by him in the South Sea, is the *M. erythroptera* quoted below.

141. Thyrsoidea isingleena, fig. 57.

Muræna isingleena, *Rich., Voy. of Sulphur*, 108, pl. 48, f. 1; *Report on the Fish. of China, Ereb. & Terr.* 86; *Reeves, Icon. in Brit. Mus.* 237; *Hardw.* 305; *Brit. Mus.*

Diagn. Ground-colour, yellowish-brown, broken by many black spots, varying in size from that of a pea to a small bean, but often aggregated into irregular patches of larger size. The meshes are never so regular as in *tessellata*.

About 10 uniserial, marginal nasal teeth, subulate and acute, with no small ones intervening. Three tall ones on the mesial line of the disk, and *one row of very short, acute vomerine teeth*. Eleven or 12 reflex palatine teeth, the 3 heading the series smaller, and within them 2 *taller, slender teeth, forming the second row*. The mandible has 10 or 11 lateral teeth, with 4 larger ones more widely set at the fore end of the limb. The head is covered with spots of the size of a pea, in which it differs from *bullata*, which has only a few small dots on the head. The furrows on the throat are not black, and the spots are scattered over the belly, in which respect also it differs from *bullata*. No white edges to the fins. Eye rather small, placed over the middle of the jaws. Gape of the mouth moderate. Dorsal commencing before the gill-opening, and

the fold of the skin which encloses it extending along the nape. Anus very little before the middle of the fish.

Length of the specimen in spirits, 16·4 in. To anus, 8 in. To gill-opening, 2 in. Length of a dried skin, 47 in. (*Richardson.*)

Sea of China, near Canton. (British Museum, J. Reeves, Esq.)

Two larger specimens exist in the Leyden Museum.

142. Thyrsoidea tessellata.

Muræna tessellata, *Rich., Voy. of Sulph.* 109, pl. 45, f. 5–8; *Ereb. & Terr.* 88; *Bleeker, Diagn. Beschr. Sumatra; Tydschr., Ned. Ind.*

Covered by large reticulations formed by white lines. Anterior nostril tubes white and very short. Skin of the snout roughened by small elevations.

Nasal teeth, 12; *uniserial*, subulate, very acute, not tall. Three teeth on the mesial line of the disk, the posterior one being the tallest in the mouth, thickish at the base, and very acute. *Vomerine teeth uniserial, short, acute.* Palatine teeth, 10 in the outer series, more compressed than the nasal ones, very acute and reflex, forming a slightly-arched row; *inner row of 2 taller ones at the fore end of the bone.* Each limb of the mandible is armed anteriorly by 3 tall teeth, like the nasal ones, the second being the stoutest and tallest, and in the same line, by 14 lateral teeth, which are subulate and reflex, the foremost being smaller than the rest. The mandible is slightly concave or recurved.

This *Muræna* has a different form from *cancellata*, a more obtuse snout, a full and not concave profile, a shorter gape, smaller eye, lower dorsal fin, and different colour, with fewer and larger meshes formed by the white lines. The meshes are much less numerous than those of *faraginea*. The dorsal commences before the gill-opening, and the vent is about one-fiftieth of the whole length before the middle of the fish. The posterior openings are not tubular.

One specimen exists in the Museum of Haslar Hospital, and another was presented to the British Museum by the College of Surgeons. They are supposed to have come from the southern seas, but the place of capture of either is unknown. (*Richardson.*)

Sumatra (*Bleeker*).

Total length, 9·01–13·5 in. To anus, 4·20–6·5 in. To gill-opening, 1–0·82 in.

143. Thyrsoidea cancellata, fig. 59.

Muræna cancellata, *Rich., Ereb. & Terr.* 87, pl. 46, f. 1–5; *Bleeker, Diagn. Beschr. Sumatra.*

Muræna Valenciennii, *Eydoux & Souley. Bon.* t. 1, 207, pl. 8, f. 1.

Nasal marginal teeth, 10; pretty tall, compressed, subulate, and acute, with 2 minute ones between each pair. Three tall subulate and not compressed teeth stand on the mesial line overtopping the marginal ones. All the larger nasal teeth are attached to the orifices of deep holes in the bone. *Six short-conical acute teeth form a single short series on the vomer. Palatine teeth, about* 17, *close set, and much reflexed, forming an outer series.* They are narrowly lanceolate and compressed, with entire, acute edges. Two larger ones stand close within the commencement of the series, *making a very short interior row.* The mandible is armed by from 18 to 21 lateral teeth, similar to the palatine ones, and also by 2 or 3 on each limb near the symphysis, stouter and taller than the opposing marginal nasal teeth; and between each pair there are 1 or 2 minute, acute teeth, a little exterior to the centres of the large ones, as in the upper jaw.

This *Muræna* is more compressed throughout than many others, and the compression increases as usual towards the tail. The dorsal is not enveloped in so thick a fold of skin as in most, and is therefore more conspicuous. The posterior rays are longer than the height of the part of the body on which they stand, but, owing to their oblique position, the fin is not so broad. The dorsal at its origin, before the gill-opening, above the fourth vertebra, rises in a low curve. The snout is obtuse, but being depressed below the swelling nape seems slender. Posterior nostrils not tubular. Eye moderately large. Lower jaw scarcely perceptibly longer than the upper one. Ten long, slender, or thread-like branchiostegous rays curve round the wafer-like operculum.

Body, tail, and fins, reticulated by white meshes, enclosing brown disks, which are mostly hexagonal, and number anteriorly five or six in the height of the body and fin, becoming gradually fewer as the fish tapers off in the tail. The Sumatran specimen in the British Museum, which was received from the College of Surgeons, has more regular and continuous meshes than are shown in our figure. The lines are wider at the angles of the meshes, and the brown colour of the areas is produced by microscopical, wavy bars on a paler ground. The belly is whitish, with a slight clouding.

The skull of this fish has a very slight, acute mesial crest, extending from the hinder point of the nasal bone, to the occipital spine, and nowhere rising above its general level. The margin of the orbit is completed behind by rather stout, tubular, suborbital scale bones; but under the orbit, and before it, these bones remain membranous. The turbinate bones, as in the other *Murænæ*, are long, narrow, and thin, flanking the nasal ridge. The nasal disk is perforated by numerous holes, to the edges of which the teeth are anchylosed, and it seems as if it had a double floor. There are 50 vertebræ anterior to the beginning of the anal, and about 77 posterior to it, or about 127 in all. Twelve next the cranium have, in addition to the transverse parapophysis, a thin spine descending from the under

mesial line of the centrum. This spine or crest is highest at the third or fourth vertebra, and diminishes gradually to the twelfth. Posterior to that, the under angles of the parapophysis gradually approach each other beneath, forming a deep hæmal canal, and at the termination of the abdominal cavity a central under-process is formed, as it were, by the union of the under angles of the parapophyses, while the upper angles retain their horizontal direction, and gradually diminish in size as they approach the end of the tail. A long series of ribs, reaching from the cranium nearly to the tip of the tail, is attached to the centra of the vertebræ above the parapophysis, through the medium of membrane; and from the beginning of the anal to the end of the tail, a similar series is attached to the centra between the lateral and inferior parts of the parapophyses. These ribs are stoutest about the middle of the tail, and have each a forked end next the centrum, the short limb of the fork forming a knob or head. The interneural processes correspond in number with the dorsal rays, and the rays of both fins, though fissile at their tips, are not jointed.

Stomach a long, wide, cæcal tube (measuring in the specimen here described 5·6 inches from the gullet to the point of the sac), plaited longitudinally within, in about ten fine folds. Pyloric orifice lateral, near the œsophagus, opening directly into a much more slender intestine, which lies parallel to the stomach. The intestine is reticulated interiorly, the wrinkles becoming gradually more delicate, and disappearing in the lower part of the canal. At the junction of the small intestine with the wider rectum its inner coat projects so as to form a circular valve, but the gut was not in a condition to enable me to ascertain whether a complete spiral valve existed or not. Air-bladder of a long-oval form, an inch in length.

Rays: Br. 10; D. 345; A. 236=591 (Australian spec.).

Length, 17·5 inches. To anus, 8 inches. To gill-opening, 2·45 inches.

Obs.—McClelland characterises his *Thærodontis reticulata* (which we have supposed may prove to be identical with the *Gymnothorax faragineus* of Bloch) as follows: "Teeth sharp and hooked, consisting of a single row on the edges of both jaws, and a double row on the centre of the back part of the palate, with three movable fangs near the apex of the upper jaw. Crown of the head high and rounded, every part of the body marked with black, pentangular spots, separated by narrow white lines." (Calcutta Journ. of Nat. Hist. July, 1844.) (*Richardson.*)

Cape Upstart, and Sumatra (British Museum). Western Australia (*Surgeon Bynoe, R.N.*). Sandwich Islands (*Eydoux and Souleyet*). Madeira (*Dr. Smith*).

144. THYRSOIDEA TENEBROSA.

Muræna tenebrosa. *Banks and Soland. MSS. in Br. Mus.; Rich., Ereb. & Terr.* 84.

Nasal teeth, 21, pretty tall, rather widely set, subulate, and very acute, in one series forming a semicircle round the end of the jaw, the front teeth being the lowest, and 11 of them taller than the rest. Three tall, subulate, and slightly-recurved mesial teeth on the disk. *Followed after an interval by 9 short, acute, vomerine teeth, disposed in one slightly-irregular row.* Palatine teeth, 17, tapering, and very acute; the 4 anterior ones shortest, the middle of the series tallest, and all slightly reflex; an inner row of palatine teeth is formed by 3 taller ones. Each limb of the mandible is armed by 16 or 18 teeth, resembling the palatine ones, with 3 tall subulate interior ones at the fore end, making there two rows.

This slender and considerably compressed *Muræna*, has the dorsal commencing well forward on the nape before the gill-openings, and the anus situated about one twenty-sixth part the whole length before the middle of the fish. The tail is acute. The colours have totally faded. Solander's short description which mentions them is as follows:—"*Iris castanea. Pupilla nigra, annulo luteo. Pori capitis concolores cum corpore. Tota e sordidè purpureo fusca, fasciis maculisque transversalibus, latis, numerosis, nigricantibus; tam obscurus est piscis ut primo intuitu vix inter colorem corporis et fascias differentia videtur. Dentes in maxillis et fauce uti in antecedente* (M. atomaria). *Nullum autem labia faucis videre licuit.*"—Solander, l. c. (*Richardson.*)

Length, 13·5 in. To anus, 6·22 in. To gill-opening, 1·62 in. (*Rich.*) To the anus, 6·30 in.; length of tail, 7·29 in. (*Kaup.*)

Polynesia.

The British Museum possesses a specimen of this fish preserved in spirits, which was obtained from the College of Surgeons, and was most probably the individual taken on Cook's first voyage, at the Society Islands. The native name is written "*Epui*," or "*Ebui.*" (*Richardson.*)

This species approaches very near to *Muræna tristis* (115).

2. *Spotted Species.*

145. Thyrsoidea moringua.

Muræna moringua, *Cuv. Regn. An.* 11; *Rich., Ereb. & Terr.* 89.
Muræna curvilineata et caramura, *Castelneau*, pl. 42, f. 2, and 43, f. 1.

Rays: D. 323; A. 232 = 555 (Jamaica spec.).

Nasal teeth, 12, tall, stoutly subulate, compressed, with sharp edges, and generally 2 minute teeth between each pair, all in one row. Three mesial teeth, and 9 *very acute, shortly-subulate, vomerine teeth in one row.* Palatine teeth, 18 or 19, much compressed, acute and reflex, the anterior 3 small, and succeeded immediately by the

tallest in the row, the following ones decreasing as usual towards the corner of the mouth. In one specimen there is a tall, slender tooth within the commencement of the outer row, but this is absent in five or six other specimens, having probably been broken away. The mandible is armed anteriorly by 3 tall, stout, subulate teeth on each limb, with 2 or 3 minute ones between them, and laterally by about 19 compressed, acute teeth, forming an even, low series.

Dorsal commencing between the nape and gill-opening. Anus about a twenty-fourth part of the total length before the middle of the fish. Gape of the mouth large.

Ground colour pale, with dark, liver-brown spots of various sizes, from that of a pea downwards, and more or less confluent, but generally retaining a roundish form. The spots are smaller, rounder, and more distinct on the head and more confluent near the end of the tail, the pale ground-colour occupying, however, less space than the spots, everywhere except on the cheeks. The tint of the spots is less deep on the belly.

Length, 23·5 in. To anus, 10·75 in. To gill-opening, 3·4 in. The species attains the length of upwards of 3 feet.

Cuvier refers to the *Muræna maculata, nigra* of Catesby, t. 21, as the type of his *moringua*, but t. 20 agrees best with most of the specimens we have examined. There is, however, no very marked difference between the figures, both being coarsely drawn. The British Museum possesses a dried skin in which the pale interspaces are narrower, and reduced nearly to the winding reticulations of *M. thyrsoidea*. (*Richardson.*)

Tail longer and more slender than in other species.

The M. *caramura* of Castelneau is a paler variety, with an almost flesh-coloured ground tint. The jaws, up to the corner of the mouth, are black. On the throat there are interrupted black lines, separated by cloud-like grey patches. Round the small gill-opening there is a black wreath. On the body irregular spots, which on the paler fins are drawn out longitudinally. This specimen was brought by Castelneau from Bahia. It is 20·28 in. long, whereof the tail measures 11·14 in. On the palatines there are only 14 teeth, and on the vomer 10.

Bermudas, Gulf of Mexico, Martinique, and Caribbean Sea generally.

146. Thysoidea stellifer.

Muræna stellifer, *Rich., Ereb. & Terr.* p. 86.

Diagn. Liver brown, with four rows of rather widely placed, pale bluish or whitish round dots, a little radiated on their margins. The upper row runs along the base of the dorsal, and is not very conspicuous unless the fin is raised; the under one, traversing the belly, is regular, and the spots on the sides are very uniform in

their sizes and distances. The dorsal and anal are very narrowly fringed with white or pale blue.

Nasal teeth, 10 in one series, subulate, very acute, slightly compressed at the tips, and pretty tall. Three slender mesial teeth, the second and third very tall. *One row of very short, moderately acute vomerine teeth.* Palatine teeth biserial, 12 in the outer row, gradually augmenting in size towards the corner of the mouth, acute, lanceolate: inner row, 4 or 5 slender, tall teeth. Mandible furnished on each limb with a series of about 20 or 21 lanceolate and very acute teeth, all reflex, the anterior ones smaller, but as closely set as the lateral ones.

Anus about one twenty-fourth part of the length anterior to the middle of the fish. Fins conspicuous. Dorsal commencing before the gill-opening. Tail compressed, tapering, rather acute.

This species differs from *bullata* in the spots being smaller, more regular and pale on a dark ground.

Length, 7·1 in. To anus, 3·3 in. (*Richardson.*)

Madagascar (British Museum, presented by Dr. Gray).

147. Thyrsoidea bullata, fig. 60.

Muræna bullata, *Rich., Ereb. & Terr.* 86.
Muræna tigrina, *Cuv. ex Voy. du Peron.*
Muræna leopardina et melanostigma, *Leyd. Mus.*

Marginal nasal teeth about 8 tall, subulate ones, with several small ones between each pair; 3 teeth as usual on the mesial line, and a *series of acute vomerine teeth*, mostly concealed by the swelling of the soft parts. Palatine teeth, 16, compressed-subulate, very acute, reflex, the 4 anterior ones smaller, and within them, in a *second series*, 3 *tall setaceous teeth*. Sixteen lateral teeth on each limb of the mandible, resembling the palatine ones, and 3 tall, subulate ones next the symphysis, in the same row.

Eye moderately large. Dorsal commencing before the gill-opening. Anus about one-fourteenth of the whole length before the middle of the fish.

General colour of the fish after maceration in spirits, lavender-purple, varied by about four rows of round black spots, as big as swan shot, one of the rows being on the dorsal: the lowest row is of smaller spots than the others, and none of them are perfectly regular in their distribution. Some of the spots are conjugate, and at the tip of the tail they form bars. The inside of the mouth is purple. The furrows of the throat and cheeks are black. Edges of the dorsal and anal pale. Belly not spotted.

This fish is spotted much like *M. isingleena*, and it may be merely the young of that species, or a local variety, the dentition being similar, but as there is a difference in the general tint, and the spots are fewer, more simple and regular, the gape of the mouth

larger, and the anus a little farther forward, I have given it a specific name.

Length, 12·4 in. To anus, 5·35 in. To gill-opening, 1·46 in.

Sea of Borneo (Sir Edward Belcher). (*Richardson.*)

Java (*Kuhl*).

This species is undoubtedly distinct from *isingleena* (*Kaup*).

3. *Almost of a single tint.*

148. Thyrsoidea longissima.

Thyrsoidea longissima, *Kaup.*

Diagn. Length of the head contained twenty times in the length of the whole body. An extremely elongated form, with a long head and very large mouth. The eyes situated much nearer to the tip of the snout than to the corner of the mouth. Dorsal commencing an inch behind the occiput. Lateral line composed of interrupted, short, whitish, and sunken lines. The colour is dark brown, or, perhaps, greenish, with lighter under surface.

Nasal teeth, 12; vomerines, 7, short, and forming one row. Palatines, 20 in the outer row, 8 in the inner row. Mandibulars, also 20 in the outer row, and 8 in the inner one.

Total length, 38·58 in. Length of tail, 23·32 in. Length of the mouth, 1·54 in. To the eye, 0·20 in. To the gill-opening, 3·78 in. Height of the body, 0·82 in.

An Indian specimen, taken at Bombay by Dussumier, measured $58\frac{3}{4}$ in.

Sea of Hindostan (Paris Museum. Two specimens).

149. Thyrsoidea lineopinnis, fig. 61.

Muræna lineopinnis, *Rich., Ereb. & Terr.* 89.
Murænophis vicine, *Castelneau*, pl. 42, fig. 4

Rays: *circiter*, D. 320; A. 160 = 480.

About 10 pretty tall, compressed-subulate, very acute, uniserial nasal teeth, and an equal number of small teeth in the intervals. Three taller mesial teeth, and 7 or 8 small acute vomerine ones, *set alternately a little to the right and left, so as to approach a biserial arrangement.* Fourteen narrowly-lanceolate palatine teeth, the 3 anterior ones being small, the middle ones larger, and the posterior ones decreasing gradually as they approach the corner of the mouth. One or two very slender, and not tall, movable interior teeth, at the fore part of the bone, render the arrangement biserial. The fore part of the mandible is armed, on each limb, by 4 or 5 tall stout teeth, with a small and rather more exterior one in each interval. These are followed, on the sides of the bone, by 6 small,

close-set, acute, compressed teeth, and in succession by 10 larger reflex, narrowly-lanceolate ones, which are sensibly *larger the nearer they are to the corner of the mouth.*

This *Muræna* is considerably compressed, with a swelling throat, a pretty large gape, and the dorsal commencing by an abrupt curve about midway between the eye and the gill-opening. The fin is high, and the investing fold of skin being rather thin, its rays are more than usually visible. (In the young fish, the rays are more distinct, and there is a trace of pores on the lateral line.) The anus is one-eleventh of the whole length of the fish anterior to the middle. Colour, after maceration in spirits, purplish- or brownish-black, without spots, the ventral surface being paler. The dorsal is traversed by fine oblique lines of a darker hue, for the most part seven or eight in the height at any one point. The anal, which is low, has fewer lines, and the two fins are narrowest at their union round the tip of the tail. The folds of throat are marked out by fine black lines.

Length, 22 in. To anus, 10·5 in. To gill-opening, 2 in. Height of body, 1·25 in. Circumference, 3 in. Height of dorsal fin, 0·75 in.

Puerto Caballo (British Museum). In the Paris Museum there is a larger specimen, presented by Count Castelneau.

150. Thyrsoidea maculipinnis.

Thyrsoidea maculipinnis, *Kaup.*

Diagn. Dorsal distinct, traversed by many horizontal black lines and light-brown spots of irregular form.

Nasal teeth, 10, uniserial, pretty tall, subulate, and very acute; 4 in front, with small ones in the intervals. Mesial teeth, 3 taller; vomerines, 7 or 8, very short, in one row, and not standing alternately to right and left; palatines, 12, narrowly lanceolate, the most anterior 2 being small, the middle ones larger, and the posterior ones decreasing towards the corner of the mouth. *A single, pretty tall, movable, interior tooth, on the fore part of the bone, renders the arrangement biserial.* Mandible, armed in the fore part of each limb, by 3 tall stout teeth, and a small one placed a little exterior to each interval; these are followed by 16 shorter, compressed, acute teeth.

This species has a pretty close resemblance to the *lineo-pinnis* (149); but its head is more slender and longer, and the tubes of the anterior nostrils do not stretch beyond the contour of the snout. It has traces of oblique lines on the dorsal, together with irregular lighter brown spots on the dorsal and adjoining part of the back. The tail is longer than the body by about the length of the head.

Western tropical Africa. Gold Coast (Leyden Museum).

4. *Banded species.*

151. Thyrsoidea colubrina.

Muræna colubrina, *Commerson apud Lacep.* v., p. 641; *Rich., Ereb. & Terr.* 88, pl. 19, f. 1.
Muræna fasciata, *Banks and Solander, MSS.* p. 68 (*British Museum*).
La murænophis colubrine, *Lacep.* v., pp. 641–642.

Diagn. The whole fish crossed by fifteen irregular bars; the end of the snout, and of the tail, white.

A *Muræna* taken among the Society Islands on Cook's first voyage is briefly noticed in Solander's notes, as follows: "Muræna fasciata, *tota fasciata, fasciis latis ex albido cinerascentibus, fasciæ duæ in capite lutescentibus. Iris argenteo-fuscescens. Pupilla nigra. Fasciæ per pinnas extenduntur.*" Native names, "Epui-earhu." Except in the existence of the bands, there is little in this notice to identify it with a banded *Muræna* which the British Museum received from the College of Surgeons. The origin of the specimen is not recorded; but it was associated in the collection with some fish collected on Cook's voyage. Lacepede's figure of *M. colubrina* represents our fish pretty well, and shows the fins fringing the point of the tail; yet in the "Règne Animal," it is quoted as specifically the same with the *Muræna annulata* of Thunberg, which is an *Ophisurus* with double the number of black rings on the body.

Nasal teeth, 12, slenderly subulate and very acute, in one series. Three taller ones on the mesial line of the disk, *and 9 very low, small, bluntish teeth, in a single row, on the vomer.* Palatine teeth biserial; outer row of 12 or 13 teeth, which are narrowly lanceolate, very acute, low, and much reflexed; the inner row consists of 4 tall, slender teeth, standing opposite to the commencement of the outer row. Each limb of the mandible is armed by 24 acute, compressed teeth; 3 of which, near the symphysis, are set alternately with 2 minute ones: the following teeth are similar in height, regularity, and inclination to the outer palatine ones.

Jaws equal. Posterior nasal opening with tumid lips, placed very near the superior anterior margin of the orbit. The anterior ones end in rather long tubes. Body considerably compressed, particularly posteriorly, the tail tapering, and ending very acutely. Anus about one-fourteenth of the whole length before the middle of the fish. The dorsal fin is very conspicuous, and the fold of skin in which it lies is thinner than usual in the *Muræna*, so that the rays can be readily seen when it is held up to the light. They are not, however, easily reckoned, owing to their tenuity, and they are shorter at the tip of the tail than on the back. The reticulations of the skin produced by the muscular fasciculi are very fine, and the lateral line is imperceptible, though there is a furrow where the muscles of the side meet.

The ground-colour of the specimen, which has been long macerated in spirits, is brownish, that of the fins being pale yellow, or soiled white; both are crossed by fifteen very regular and neatly-defined black bars, not so wide as the interspaces. The first bar includes the eye, the second is immediately behind the mouth, the third passes over the gill-opening, the seventh is just before the anus, and the last is on the end of the tail, leaving only the white tip of the fin beyond. The bars contrast more strongly with the pale fins than with the browner body. Length, 8·4 in. To anus, 3·6 in. To gill-opening, 1 in. (*Richardson.*)

New Britain, Amboyna (*Commerson*). Polynesia? (*Solander*).

Solander also describes a *M. vittata;* but this derives its name from a longitudinal stripe.

"Muræna vittata. *Piscis suprà intense e fusco brunneus, vitta secundum medium dorsum e flavo albida, a capite usque ad finem caudæ, subtus infra lineâ laterali totus sordide e luteo albescens. Oculi minuti. Iris flavco-aurea. Pupilla nigra.*" "*Eualha*" *aboriginorum.* (Banks et Solander, MSS. p. 78.)

Society Islands.

β. Nasal teeth uniserial; vomerines biserial.

152. Thyrsoidea arenata.

Thyrsoidea arenata, *Kaup.*
Muræna thyrsoidea, *Rich., Voy. of Sulph.* iii., pl. 49, f. 1; *Ereb. & Terr.* 91; *Cantor, Mal. Fish.* 330.
Murænophis arenatus, *Cuv., Paris Museum.*

Twelve nasal teeth, in one series, moderately high, rather closely set, conico-subulate, not very acute. Three tall, slender teeth on the mesial line. Vomerine teeth biserial, short, not very acute; first tooth of each row the largest. The rows are farthest apart anteriorly, and approximate posteriorly. Palatine teeth biserial; the outer row constituted by 10 much shorter, compressed teeth; the inner row by 8 more slender and taller subulate ones, which extend as far as the outer row. Each limb of the mandible is armed by 18 or 19 conical acute teeth, with an interior row at the fore-end of the jaw.

Body high and considerably compressed, with a deep dorsal which commences before the gill-opening, the loose fold of skin which invests it extending forwards to the head. End of the tail rounded. Posterior nostrils not tubular. The reticulations of the skin are coarser than in most other species. Anus one-thirteenth part of the whole length before the middle of the fish. Pores of the lateral line distinct.

The figure in the "Ichthyology of the Voyage of the 'Sulphur,'" was taken from a drawing executed under the eye of Mr. Reeves, at Canton; but the specimen presented by that gentleman to the British Museum has much coarser pale lines, with dilatations at the points of intersection.*

Length, 26 in. To anus, 11 in. To gill-opening, 2·6 in. (*Richardson.*)

Sea of China. Estuaries.

153. Thyrsoidea sathete, fig. 63.

Murænophis sathete, *Ham., Fish. of the Ganges*, 17 and 363; *Icon. Hardw. ined. No.* 308, *upper fig.* (*British Museum*).
Muræna sathete, *Rich., Ereb. & Terr.* 91; *Cantor, Mal. Fish.* 331.

Diagn. Brown, with dull yellow throat and belly. Lateral line rendered conspicuous by a series of silvery dots, and the dorsal coloured grayish-purple.

Nasal teeth, 12 or 14, in one marginal series, each curved backwards so acutely as to form a slight notch in the middle of the posterior side, their cusps being compressed, but not pointed. Two stout conical and not acute teeth, stand on the mesial line of the disk; and the vomerine teeth are *disposed in two lines*, which coalesce behind, each line containing 6 or 7 small rounded teeth, headed by one larger than the rest. Palatine teeth in two rows; the outer row composed of 12, smaller than the nasal teeth, and more closely set, but of similar form and curvature, having their cusps, however, more compressed and acute edged; the inner row contains 10 or 11 taller and more slender cylindrical teeth, with acute, but somewhat oblique, cusps. The mandible is armed on the two posterior thirds of each limb by 11 or 12, similar to the exterior palatines; and on the anterior third by two rows; the outer row consisting of 8 conical or cylindrical and rather obtuse teeth on each limb, smaller than the lateral ones; and the inner row of about 5, rather longer than the latter, but similar in form.

Dorsal commencing about half-way between the gill-opening and the nape.

In the dried skin some of the pores have become deep black dots, of which one series can be traced over the gill-opening, and a short way along the side, in the course of the lateral line; another row runs from the angle of the mouth over the branchial membrane, and there are a few pores under the jaw.

Length, 32·5 in. To anus, about 15·5 in. To gill-opening, 3·6 in.

India (British Museum. A dried skin from J. Reeves, Esq.).

* I have great doubts of the figure, in the voyage of the "Sulphur," executed from a Chinese drawing in possession of Mr. Reeves, being a representation of the fish here described by Sir John Richardson. (*Kaup.*)

154. Thyrsoidea ceramensis.

Muræna ceramensis, *Bleeker*, *Murænoiden.*

A short, thickish species, with a blunt head and somewhat swollen snout. The eyes half the length of the snout. Dorsal not much developed, pretty low, and commencing immediately behind the occiput. Anus nearly in the middle of the fish.

Nasal teeth, 16, of which 3 lateral ones are very small; on the mesial line, 3. Palatines, 12; 2 in the interior row. Vomerines, 8, the front one blunt, one irregularly thrusting out of the row, and one indicating a second row. Mandibulars, 16–17, foremost three pairs bigger.

Total length, 10·43 in. Length of tail, 5·32 in.

Bleeker says that the colour of this fish is brown, clouded by a darker brown tint; the fins also brown, with darker clouds.

Owhyhee, Ceram (*Bleeker*). Java (*Kuhl*). Nouhahiva (Paris Museum. Two spec.).

155. Thyrsoidea Boschii.

Muræna Boschii, *Bleeker*, *Murænoiden.*

Nasal teeth, 6–8. Palatines, 11 in the outer row, 7 in the inner one. Vomerines, 14, short and blunt, in two rows. Mandibulars, 11 in the outer row, 7 in the inner one; on the mesial line, 2. Dorsal commencing before the gill-opening; and the anus situated before the middle of the fish. Colour brown.

Rays: D. 300; A. 180 = 480; C. 10.

Total length, 5·32 in.

Sumatra (*Bleeker*).

156. Thyrsoidea prosopeion.

Muræna prosopeion, *Bleeker*, *Diagn. Beschr. Sumatra.*

Nasal teeth, 14; on the mesial line, 1. Palatines of the outer rank, 18–20; of the inner one, 8–13. Vomerines, 20–27, blunt, and in two rows. Mandibulars of the outer row, 22–25; on the inner side, close to the symphysis, 3–5. Dorsal beginning before the gill-opening. Anus situated before the middle of the fish.

Fore-half of the head chestnut-brown; body orange-coloured, irregularly spotted with brown. A brown stripe on the edge of the anal.

Rays: D. 285–350; A. 190–245 = 635 or 435; C. 12.

Priaman, Sumatra (*Bleeker*).

157. Thrysoidea multifasciata.

Thyrsoidea multifasciata, *Kaup.*

Nasal teeth, 12, evenly disposed, in one row, forming a regular

semi-oval. On the mesial line 2, the posterior one the tallest. Palatines of the outer row, 13, of equal height; of the inner row, 3, thinner and taller. Vomerines, 21, short, but pointed; *the anterior six pairs forming a double row*. Mandibulars, 20, 4 *movable ones in front in an inner row* (2 of them broken away in the specimen).

The anterior nasal tube reaches over the lip, and the posterior one, which is slightly bordered, looks backwards. Diameter of the middle-sized eye contained once and a half in the length of the snout; it is nearer to the tip of the latter than to the angle of the mouth. Mouth pretty large. Dorsal commencing over the gill-opening.

Ground-colour yellowish-brown; the head dotted with black and marbled with white; irregular white spots enclose the labial pores. Many irregular bands, connected by reticulations, exist on the body and fins. Short rough protuberances are situated on the edge of the lips.

Total length, 10·04 in. Length of tail, 4·92 in.

Moluccas (Leyden Museum. Two specimens; one of them nearly black).

γ. Nasal teeth biserial; vomerines uniserial.

158. Thyrsoidea Augusti.

Thyrsoidea Augusti, *Kaup*.
Muræna guttata, *Rich., Ereb. & Terr.* 90.
Murænophis punctatus, *Paris Mus.*

Diagn. Numerous pale dots, not exceeding the size of the head of a small pin.

Nasal teeth in two series, so closely approximated that they appear, until narrowly examined, to be in but one. The outer row is composed of about 9 very short, stoutly-subulate, acute teeth, alternating with an inner row of 8 taller, conico-subulate, very acute ones, which are irregular in height, and variously recurved and reflex. The mesial line of the disk supports 3 tall stoutly-subulate teeth, and on each side of the hindmost of these there is a tooth equally tall, and almost filling the space between it and the marginal rows. There are also several smaller and shorter teeth scattered over the disk, so that in this species the nasal bone is pre-eminently dentiferous. *Vomerine teeth*, 11, *uniserial, short, and compressed at the tips; but not pointed*. Palatine teeth biserial; the outer row consisting of 14 short, slightly-recurved, and reflex teeth, which diminish gradually in size from the fifth, or tallest, to the corner of the mouth; the inner row is some distance from the outer one, and reaches nearly as far back; it is formed by 8 taller and more distant subulate teeth. Each limb of the mandible is armed by about 21 acute teeth, all in one row, mostly recurved, and slightly

reflex. The anterior teeth are rather the longest: but there is no abrupt transition in the series.

Head small; gape large, with the eye placed decidedly before its middle. Posterior nostrils not tubular.* Anus exactly in the middle of the length. The specimen is so much stuffed that the origin of the dorsal cannot be made out; but posteriorly the fin appears to have been high. The anal is sufficiently conspicuous.

The ground-colour of the dried skin is dark purplish-brown, and it is regularly marked by pale round dots, the largest not exceeding the size of the head of a small pin. The dots are biggest and most crowded on the head and fore part of the body, where they occupy fully more space than the ground-colour. Posteriorly they are farther apart, and are surrounded by dark borders; and towards the end of the tail they are not only more distant, but also decidedly less. They are smaller throughout than the spots of *punctata* of Schneider, and still more so than those of *pavonina*.

Length, 40·25 in. To anus, 20·15 in. To gill-opening, 5·5 in

Madeira (*Richardson*).

159. Thyrsoidea microdon, fig. 64.

Thyrsoidea microdon, *Kaup*.

Blunt head, tumid snout, and very short fore-nostril tubes. Eye small, situated over the middle of the jaw. Dorsal commencing over the gill-opening.

Nasal teeth, two-ranked, the 6 forming the inner row bigger. Palatines of the outer row, about 20; of the inner row, 5 taller ones. Mandibulars, 20, in the outer row; 4 bigger ones, forming the inner row, placed in front.

Total length, 18·89 in. Length of tail, 9·44 in.

Colour, dark bluish-violet, with black interrupted, branching, vein-like lines. Across the occiput, a row of pores, which is continued by two short longitudinal lines behind the eye.

160. Thyrsoidea chlorostigma.

Thyrsoidea chlorostigma, *Kaup*.

Ornamented with yellowish dots, of the size of partridge-shot, bordered with black, and placed quite regularly at equal distances, except that towards the end of the tail, they become more remote from each other. At the end of the tail, alone, there is a yellowish

* Sir John Richardson is mistaken in referring the fish here described to the *Muræna guttata* of Banks and Solander, which is our *Limamuræna guttata* (No. 170), and has the long posterior nostril-tubes, mentioned by Solander. As, to prevent misapprehension, a new specific designation became necessary, I have used my privilege of bestowing on it the name of my highly-valued friend Professor August Dumeril. (*Kaup.*)

indented cross-bar. On the vomer, only, one row of conical, bluntish teeth, the first of the 12 being the thickest. A large and very beautiful specimen from the Seychelles exists in the Paris Museum. It is 24·41 in. long, and its tail measures 13·36 in. This species cannot be confounded with *punctata*, which is a true *Muræna*.

161. Thyrsoidea Blochii.

Muræna Blochii, *Bleeker*, *Murænoiden*.

Nasal teeth, about 20, very small ones in the outer row; 4 pairs of longer and stouter ones in the inner row; mesial teeth, only 2; palatines, 12, slender and short ones in the outer row; 4 taller ones in the inner row; vomerines, 8 in one row, short and pointed; mandibulars, 20 in the exterior row; 4 pairs in the interior row, towards the front of the bone.

Head pretty short, concave over the eyes; snout tumid. Gape of the mouth rather large. Eye nearly over the middle of the mouth. Anterior nostril-tube short, not reaching beyond the edge of the lip. Dorsal commencing before the small gill-opening.

Dr. Bleeker describes the colour as deep brown, marbled, and clouded with yellow.

Total length, 8·49 in. Length of the tail, 4·48 in.

Sumatra (*Bleeker*). Borneo (Leyden Museum).

162. Thyrsoidea miliaris.

Thyrsoidea miliaris, *Kaup*.

Head short and blunt, and the front nostril-tube unusually short. Jaws short, the length of the gape being contained once and a half in the length of the space between the tip of the snout and the gill-opening.

This species resembles *meleagris* (165), but the yellowish points, like pins' heads, are smaller and more regular; the head also is blunter, and the jaws are not so widely cleft. It likewise resembles *Augusti* (158), but the dots are placed much closer in *miliaris*, and the head of *Augusti* is much more elongated. A large specimen exists in the Paris collection, but it is not known whence it came. Another, sent by M. Achard from Martinique, exhibits arabesque figures towards the end of the tail, arising from the dots running into each other. The inner part of the mouth is spotted.

The following are the dimensions of the biggest specimen. To the corner of the mouth, 1·25 in. To the gill-opening, 3·14 in. To the anus, 11·40 in. The length of the tail, 12·58 in. Total length, 23·98 in. The specimen from Martinique is 18·85 in. long, of which the tail forms 9·83 in.

163. Thyrsoidea flavopicta.

Thyrsoidea flavopicta, *Kaup*.

Nasal teeth, 10-11, *conical ones in the outer row; 3 bigger ones in the inner row.* On the mesial line, 3. *Vomerines*, 10 *in one row, all short, conical*, the first one being the thickest and bluntest. Palatines, 15 in the outer row, 8 in the inner row. Mandibulars, 20 in each half of the bone, 8 in the inner row, close to the symphysis, which possesses only an incomplete row of 4 teeth, that lean against the second row.

The low dorsal begins at the occiput. The head is short, the eye of medium size, and the fore nostril-tube very short. The hinder nostril is placed over the fore corner of the eye, is small and oval, and has a black raised border. Ground-colour yellow, with innumerable black points, and zigzag and branching figures like hieroglyphics. On the throat, the black points form a zigzag longitudinal stripe. Point of the tail, yellow.

Total length, 15·35 in. Length of the tail, 8·26 in.

This species resembles *Sidera pantherina*.

Brazils (Paris Museum).

164. Thyrsoidea unicolor.

Muræophis unicolor, *Delaroche, An. du Mus.* xiii., pl. 25, f. 15.
Muræophis Cristini, *Risso.*
Muræna monaca, *Cocco.*
Muræna unicolor, *Bonap. Cat. Meth.*

Ground-colour, yellowish-brown, with, on the fore parts, innumerable black zigzag cross-bars, mostly interrupted. Borders of the fins, yellow. A deep black longitudinal stripe on the throat. The species is remarkable for the size it attains. A skin in the Paris Museum measures 33·46 in., whereof the tail forms 16·53 in.

Ivica (*Delaroche*). Madeira (*Cuv.*). Madagascar (*Quoy and Gaim.*).

δ. *Biserial nasals and vomerines.*

165. Thyrsoidea meleagris.

Muræna meleagris, *Shaw, Nat. Misc.* pl. 220; *Gen. Zool.* 32; *Rich., Ereb. & Terr.* p. 93.

Diagn. Chestnut-brown, the whole body thickly studded with small round yellow spots, having black borders, placed at pretty regular distances in each locality. An irregular yellow band on the end of the tail.

Nasal teeth, stoutly subulate, biserial; the outer row composed of teeth unequal in height, but none of them very tall; the inner row consisting of taller teeth ranged in a semicircle. Three teeth

on the mesial line of the disk, the foremost being the tallest, and ranging with the interior marginal row. *Vomerine teeth, conico-subulate, short and acute, disposed in one row anteriorly, but separating into two posteriorly.* Palatine teeth, about 15 in the outer series, close set and reflex; the first 4 augment successively in height, the fourth being the tallest in the series: the succeeding ones are considerably shorter, and diminish gradually in size as they approach the corner of the mouth. The inner series stands at some distance from the outer one, and is composed of 8 tall, widely-set teeth. At the fore part of the bone, there are 2 teeth, of intermediate height, between the rows, making three rows there. Mandible, a little recurved, and armed on each limb by 28 acute, slightly-recurved teeth, of unequal height, the inequality being greatest among the anterior ones. At the end of the jaw, there is an inner semicircle of taller teeth, not far removed from the outer one. Eye rather before the middle of the gape. Snout bluntish, with the head apparently gibbous in front. Body high and compressed. Dorsal commencing a very little before the gill-opening. Anus, one-thirteenth of the whole length, before the middle of the fish.

The colours of the specimen have partially perished, but where they remain, the ground tint is a rich chestnut-brown, thickly studded with small pale spots, placed at pretty regular distances in each locality. On the fore part of the body they are mostly angular, lunate, or oblong; on the tail, rounder and more distant, and none of them exceed the head of the smallest pin in size. They extend to the end of the snout. Interior of the mouth marked by liturate brown spots.

Length, 20 in. Length, from end of snout to anus, 9·35 in.

This description is drawn up from Shaw's specimen preserved in the British Museum. (*Richardson.*)

Southern Ocean (*Shaw*).

166. Thyrsoidea grisea, fig. 95.

Murænophis griseus, *Commerson, Lacép.* v., pl. 19, f. 3.
Muræna bilineata et geometrica, *Rüpp. Neue Wirbeth.* 84 *et Atlas.*

Head, marked by rows of points, which form angular figures: on the lateral line, fine points, which in many specimens are interrupted by bigger dots. Anal fin traversed longitudinally by two brown stripes, which are not perceptible in all specimens, having, perhaps, in some, been effaced by immersion in spirits. According to Rüppell, the head is lake-red, the body diluted yellowish-gray, with a fine white longitudinal line. Dorsal, which commences at the occiput, bluish, and anal flesh-coloured. Nasals, two-rowed: vomerines, two-rowed, the rows running into one posteriorly. The species attains a size of two feet. Dr. Rüppell obtained his speci-

men at Djidda, and the one in the Paris Museum was sent from the Mauritius, by Dussumier.

I have examined the original specimen of Commerson, which is figured by Lacepède, and can affirm that the *bilineata* and *geometrica* of Rüppell are identical with *grisea*, but this could not have been made out from an inspection of the very superficial figure of Lacépède, nor without the specimens in hand. Drs. Cantor and Bleeker have also cited erroneously the *Muræna griseus* of Lacépède.

167. Thyrsoidea tile, fig. 66.

Muræna vermiculata, *Rich., Ereb. & Terr.* p. 29.
Muræna gracilis, *Rich., Ereb. & Terr.* p. 92.
Icon. Hardw. Ined. 303 (*juv.*), pp. 309 and 310.

General tint, between dark hair-brown and wood-brown, studded with little gray specks of angular, round, oblong, crescentic, or conjugated shapes, mixed with others so minute as to be scarcely perceptible to the naked eye.

Marginal nasal teeth in two series, so closely situated as to look like one. Outer row composed of 12 or 14 very short acute teeth; inner row forming a semicircle, at the end of the jaw, of conico-subulate very acute teeth; the tooth on each side of the symphysis smaller than the rest. Three subulate teeth on the mesial line of the nasal disk; and *about* 22 *short, stoutish, but acute vomerine teeth, set alternately a little to the right or left, so as to make two irregular rows.* Two rows of palatine teeth; those of the outer row, which does not reach to the corner of the mouth, 19 in number, closely set, short, even, compressed, and moderately acute; inner row consisting of 9 taller, subulate, and very acute teeth, set more widely, but not extending beyond two-thirds of the length of the outer row. Each limb of the mandible is armed by about 24 teeth, the lateral ones disposed in an even series: at the end of the jaw there are two rows, the outer one composed of numerous low teeth, and the inner one of taller and more widely set teeth; but this part of the jaw having been injured in both specimens, their exact number cannot be ascertained.

This fish is slightly compressed anteriorly, but becomes considerably more so in the tail, which has an obtuse tip. The snout is blunt, and a little longer than the lower jaw; the nose horizontal, with a concavity in the profile over the eye, and a sudden rise in the back of the head and nape. There is also much fulness in the throat. The dorsal, which commences over the gill-opening, is low anteriorly, and highest in the tail, but is sufficiently conspicuous throughout. The anus is placed about the thirty-second part of the whole length before the middle of the fish.

In colour and markings, this species has some resemblance to

M. melagris, but the spots are smaller. The throat, and fore part of the belly, are of a livid white colour, without spots, but towards the vent the white is faintly mottled with pale gray.

Length, 17·8 in. To anus, 9·25 in. To gill-opening, 2·2 in.

India.

A specimen of *Muræna vermiculata*, which was bequeathed by General Hardwicke to the British Museum, agrees with *M. gracilis* in its dentition, and differs from it chiefly in being thicker about the throat and head, tapering more in the tail. The patterns of the spots are also different. It may, however, be that species better fed, and grown to a greater size. I am not altogether convinced that this *Muræna* and *gracilis* are distinct from Buchanan's *tile*, yet I cannot reconcile them with the drawing of *tile* (308), which is authenticated by a reference to Buchanan. (*Richardson.*)

Gracilis is undoubtedly the young fish, and *vermiculata* a synonym of *tile*. Hardwicke's figure 308 is *sathete*. (*Kaup.*)

168. Thyrsoidea prasina.

Muræna prasina, *Rich., Ereb. & Terr.* p. 93.

A dried skin of this species, existing in the British Museum, was brought from Australia by Mr. McGillivray. This gentleman says that it frequents "weedy pools among the rocks on the north side of Bondy Bay, near Sidney. It is very savage when irritated, and once, while I was collecting corallines in that locality, a large individual made a dart at my arm, and returned repeatedly to the attack, swimming slowly about, winding among the sea-weed, and raising its snout to the surface. This one measured 31½ in. to the tip of the tail, 15½ to the anus. Its depth behind the head was 2 in., its breadth 1½, and its circumference 5½." (*McGillivray.*)

Eye moderately large, over the middle of the gape. Teeth acute. *Nasal ones biserial*, but some are broken in the specimen. Outer series consisting of about 12 small acute ones; inner series of about 7 or 8 tall, stoutly subulate, and much-compressed teeth, the two rows contiguous and partially blended. Mesial row slender and subulate, not acute edged, the third one very tall and recurved. *Vomerine teeth biserial in front*, about 6 in each row, uniting to form a single row of about 7, all small and cylindrical, with conico-subulate cusps. Palatine teeth biserial; outer row composed of about 11 reflex, lanceolate teeth, with acute oblique tips. The inner row is constituted by 3 tall, slender, subulate, and recurved teeth, standing opposite to the fore part of the outer row. On the fore quarter of the mandible, there are, on each limb, 7 or 8 small exterior teeth, with 4 or 5 tall, recurved, stoutly subulate, interior ones, the penultimate one of these being the largest. Most of the larger teeth of the jaws have a minute notch in the middle of their posterior edge, and some have also a notch in front. The dorsal

fin is not high, commences about half-way between the occiput and gill-opening, and contains 356 rays to the apex of the tail. The rays at the end of the tail are short, very slender, and much crowded. The anal fin has been removed from the specimen.

Mr. McGillivray says that the colour was a "nearly uniform pale green, changing after death to dark brown. Several long interrupted dark streaks run along the throat, which, together with the neck, is minutely marked, for the most part perpendicularly, with short waved striæ of pale brown."

Length, 23½ in.

Australia.

Obs.—The *Murène linéolée* and *M. flaveolée* of Lesson, are represented as having much higher dorsals. (La Coquille, Plate 11, f. 1 and 2.) The *Gymnothorax Wilsoni* of Schneider (p. 529), which is a New Holland species, locally known by the name of "Banning," is ornamented with broad roseate spots. (*Richardson.*)

169. Thyrsoidea irregularis.

Thyrsoidea irregularis, *Kaup., Paris Museum.*

Brown, with large black spots, irregularly dispersed over the body. Fins yellowish. Palatine teeth, 16 in the outer row, 7 in the inner row; vomerines, 10 in two rows, with an anterior and a posterior larger tooth.

Total length, 18·49 in. Length of tail, 9·43 in.

Brazils. (The Paris Museum has a specimen received in exchange from Geneva).

Genus 32. LIMAMURÆNA, *Kaup.*

Diagn. Abbreviated *Thyrsoideinæ*, whose hinder nostrils issue in still longer tubes than those of *Muræna helena.*

Nasal teeth, 10–12; whereof the lateral ones are flanked by toothlets that are scarcely perceptible. On the mesial line, 3. Palatines biserial, but the inner row of 6 is for the most part defective, or falls wholly out. The outer row consists of 7 longer ones, with 10 small ones, ensconced at their roots. Vomerines, 4–6; mandibulars, 9 bigger ones, and 14 lesser ones, in a single series.

Head elongated, with a more slender pointed snout. Front nostril-tubes projecting over the lip; hinder nostril-tubes a little longer than the diameter of the eye. Body abbreviated; dorsal, commencing at the occiput. (Sometimes there are two pores on the extremity of both jaws, prolonged into two short tubes, and in the young fish the mandibular teeth are biserial at the symphysis.)

170. Limamurena guttata.

Muræna guttata, *Banks and Sol. MSS., Icon. Park.* 11, 1. *Bib. Banks: Low, Fishes of Madeira, Tr. Zool. Soc.* 11, p. 192; *Richardson, Ereb. & Terr.* p. 90.

Muræna pavonina, *Rich., Voy. of Sulph.*, 110, pl. 53, f. 2; *Ereb. & Terr.* p. 90.

Muræna pardalis, *Temm. et Schl., F. Jap.* 268, t. 119.

Calamaia paum, *Russell.*

Diagn. Colour, pitch-black, varied by regular oval spots, shaded off with brown, and smaller on the head and fins than on the body.

Ten or 12 moderately-tall, slightly-recurved, acute, uniserial, nasal teeth, with a minute tooth in each interval. Three teeth on the mesial line, the posterior 2 being, as usual, the tallest in the mouth. The vomerine series, commencing at a considerable distance behind these, is composed of 5 or 6 acute teeth. Palatine teeth biserial; 16 or 17 in the outer row, compressed, subulate, and acute, with 6 tall, slender, and acute ones, more widely set in the interior row, which reaches about half-way along the outer series. Each limb of the mandible is armed by about 19 subulate, slightly-recurved teeth, forming the exterior row, with a second row at the fore end of the limb, composed of 4 tall, slender, acute teeth.

Body high and much compressed, with a broad dorsal, which commences at a considerable distance before the gill-opening, and becomes comparatively very narrow as it rounds the end of the tail to join the anal. The gill-opening is one-seventh of the whole length distant from the end of the snout, and the vent is one-twentieth of the length before the middle of the fish.

Length, 9·6 in. To anus, 4·4 in. To gill-opening, 1·4 in. (*Richardson.*)

Madeira, Brazils.

There can be no doubt of this being the species described by Solander as quoted above. He says, "*tentacula quatuor lanceolata, compressa brevia, duo in apice rostri, duo supra angulos anticos oculorum.*" The name he gave it is the oldest, and must be adopted. Risso, at a much later date, bestowed the same appellation on a variety of *Muræna helena*.

Genus 33. POLYURANODON, *Kaup.*

Thyrsodontina having three rows of pointed teeth on the palatine bones. Nasals, 14 uniserial. Vomerines, 5–6 uniserial. Mandibulars anteriorly quadriserial, posteriorly biserial.

171. Polyuranodon Kuhlii.

Muræna polyuranodon, *Bleeker.*

Height of the body, equal to one twenty-second part of its length. Snout, convex towards the tip, concave over the orbits, and twice as long as the eye. Lateral lines having scarcely visible pores. Dorsal commencing immediately above the gills. Anus situated before the middle. Bleeker gives the following account of the colour. Body and fins yellowish-gray, with crowded larger and smaller black spots of round, oblong, and irregular forms; the spots arranged in longitudinal series.

Rays: D. 364; A. 220; = 584; C. 10.

This species, according to Bleeker, is much like *isingleena* (141), and *isingleenoides* (139), but its three rows of palatine teeth place it in a different group.

Length of the example above described, 8·70 in.

Ceram (*Bleeker*).

Genus 34. CHANNO-MURÆNA, *Richardson.*

Olim Ichthyophis et Nettastoma, *Richardson.*
Channo-muræna, *Richardson, Ereb. & Terr.*

Nostrils like those of *Muræna*. Face short and depressed, but the gape of the mouth extremely long and wide, so that the jaws can expand enormously. Body nearly cylindrical, without any appearance of the loose dorsal fold, which encloses the fin-rays in *Muræna*, but behind the anus the tail is somewhat compressed, and towards its tip, becomes thinner. Rays actually exist near the end of the tail, but they can be seen only by dissection.

All the teeth are slenderly subulate, and are disposed in even, card-like plates. On the palatines, just behind the eyes, they stand about four rows wide, but thin off to three rows towards each extremity of these bones. The nasal and vomerine plates of teeth are not separated, or perhaps the latter do not exist, in which case the nasal dental plate is broadly oval, and composed anteriorly of about six rows in width, but posteriorly the rows diminish to two, which meet in a point a little behind the eye.

172. Channo-muræna vittata.

Channo-muræna vittata, *Rich., Ereb. & Terr.* p. 90, *sub Nettastoma.*
Ichthyophis vittata. *Rich., Voy. of Sulph.* p. 114, pl. 53. f. 7-9.

Yellowish, banded by irregular bars of brown.

Genus 35. MURÆNO-BLENNA, *Lacépède, Bleeker.*

Ichthyophis, *Lesson.*

Resembling *Gymnomuræna* in being without fins, but differing widely in dentition, the teeth being rather tall, slenderly subulate,

and thinly set. Vomerine teeth irregularly biserial. On the other dentiferous bones, the teeth are triserial.

173. Muræno-blenna tigrina.

Ichthyophis tigrinus, *Less., Voy. de la Coquille*, pl. 12.

Of a very elongated form, with small eyes, which are placed nearer to the tip of the snout than to the corner of the mouth. Gill-openings situated nearer to the dorsal surface than to the ventral. Colour, brownish, with larger and smaller roundish black spots. Young individuals have six white stripes proceeding from the occiput, with irregular black spots in the intervals. In the very young, neither these stripes, nor the spots on the rest of the body, are well marked.

Total length, 22·24 in. Length of tail, 12·39 in.

Strong Island, Havre, Carteret. (*Quoy and Gaimard.*)

Moluccas (Leyden Museum). Celebes (*Forster*).

Genus 36. POECILOPHIS, *Kaup.*

I separate from the great stock of *Muranida*, the species which have blunt or more conical teeth. The vomerines are round and tessellated, disposed in two or more rows. The hinder nostrils are finely fringed on the upper border, while the fore nostril-tubes are short, and do not reach beyond the lip. Dorsal and anal fins not distinctly perceptible, so that the genus is distinguished from *Gymnomurana* chiefly by its more numerous rows of vomerine teeth.

Most of the species are ornamented by a variety of tints and spots; a few, like *Peli* (177) and *Lacomtei* (180), are more of one colour.

α. *Variegated species.*

174. Poecilophis variegata, fig. 67.

Muræna variegata, *Rich., Ereb. & Terr.* p. 94, pl. 47, f. 1–4, and f. 11–16; *Seba Thes.*, 69, f. 1, 17.

Muræna geographica, *Banks et Solander, MSS.*, 1769; *Icon. Pict Parkinsonii*, 3 ("*Pepedho*").

Echidna variegata, *Icon. ined. Georg. Forster, Bibl. Banks*, 172. *An.* 1777.

Echidna variegata, *J. R. Forster, Enchiridion*, 31, *Genus* 5. *An.* 1788. *Id., Animal. cura Lichtenst.* p. 181. *An.* 1844.

Muræna nebulosa, *Thunb. Dissert.* p. 7, tab. 1, f. 2. *An.* 1789.

Gymnothorax nebulosus, *Bl. Schn.* p. 528. *An.* 1801.

Gymnothorax echidna, *Id.*, p. 526.

Muræna, *Hardw. Icon. ined. Mus. Brit.* pl. 306.
Muræna minor, *Schl. Fauna Jap.* pl. 115, f. 2.
Muræna ophis, *Rüpp. Atl.* t. 29, f. 2; *Rich., Ereb. & Terr.* p. 93.

Diagn. From seventeen to twenty-four irregular, marbled, and branching cross-bars.

About 12 marginal, scarcely-acute nasal teeth, some of them very slightly curved backwards, ranged in an oval, which is completed behind by the vomerine teeth. The mesial line of the disk is occupied by 2 stout, conical, sub-acute teeth, rather taller than the others; and the vomer is armed by two rows of low teeth, having slightly-compressed cusps. The rows meet in a point posteriorly, and diverge anteriorly, on the angles of the vomer, so as to fill up the posterior part of the nasal oval. Palatine teeth, about 9, small, very closely set in a short even row, and having somewhat compressed, or bluntly chisel-shaped, somewhat oblique cusps. Mandible armed laterally, on each limb, by 12 or 13 even teeth, with flattish or rounded crowns, and cylindrical bodies. In some specimens an exterior row runs along the whole limb, in others it is shorter, and in others again it can be traced only in the anterior quarter of the jaw. The tooth next the symphysis, standing in this exterior row, is larger than the rest, and is followed by 2 or 3 taller conical inner teeth, seemingly a continuation of the principal lateral row, but placed wider apart.

This is either an abundant species, or, from its beauty, it is sought for by collectors; for many examples of it exist in museums. Great variety exists in the form and distribution of the spots in different individuals. The specimen figured in plate 47, fig. 1, *Ereb. & Terr.*, after long maceration in spirits, has a pale yellowish-gray or cream-coloured ground tint, with two rows of purplish-brown spots. These spots radiate into irregularly-tortuous, divaricating, forked branchlets, and their disks are pierced by one or many dots of the ground-colour. The upper row, consisting of smaller spots, runs on the dorsal fin and top of the back, the lower one on the sides, and they coalesce in a solitary spot at the end of the tail. Their number varies from twenty to twenty-four in each row; and in the specimen figured on the same plate, a third row is indicated by two or three spots on the belly. The ground-colour is further varied on the back by many detached lines and specks, bearing some resemblance to Arabic characters. Solander observed this variety in the sea, at Ulhietea, and describes its colours as follows: "M. GEOGRAPHICA, *tota alba, punctis maculis linearibus rivulisque ornata. Rivuli confluentes in areas rotundas flavedine immixtas. Caput supra gibbosum. Iris aureo-lutea. Pupilla nigra. Maxillæ circa os alba immaculata. Foramina superne in naso tubulosa, lutea: foramina etiam interocularia lutescentia. Piscis certè pulcher.*" Parkinson's figure is unfinished; but sufficiently characteristic. The name, in the language of the Society Isles, is written in the MSS., "Pipirho," "Pipiro," and "Pipirha." Hardwicke's drawing also represents this variety.

The individual represented in fig. 11 (*Ereb. & Terr.*) has three rows of spots; the lower row, which ceases about half-way between the vent and the point of the tail, being composed of spots which do not branch like the others. The ground-colour is also everywhere thickly marked with black specks, except on the belly, where the specks are few. The under surface of the belly, before and behind the vent, is represented in fig. 15 of that plate. The Forsters observed this variety at Otaheite; and George Forster's drawing differs only in showing fewer ventral spots. The native name of "Pipiro" is written on the drawing, and in the *Descript. Animal.* it is said to be also called "Boohèe." The colour is described thus: "*Color totius corporis lutescenti albus, lineis, punctis, maculisque fusco-nigris variegatus. Abdomen album, maculis fuscis subfasciatum.*" (Forster, lib. citat.)

Of fourteen specimens of these varieties, no two exactly resemble one another in their markings. The dorsal begins before the gill-opening in all, and the anus is nearly median, being in one a little before the middle of the fish, but in most a little behind, not, however, exceeding a twenty-fourth part of the whole length. As in all the blunt-toothed *Murænæ*, the gape of the mouth is comparatively small. (*Richardson.*)

The length of the specimens varies from 5 to 20 in.

Indian Ocean (*Hardw.*). Chinese Sea (*Belcher*). Coasts of Australia (*Bynoe*). Polynesian Archipelago (*Solander, Forster*). Japan (*Schlegel*).

According to Peters, the *Muræna ophis* (*Rüpp. Atl.* t. 29, f. 2; *Rich., Ereb. & Terr.* p. 93) is identical with *P. variegata*, and my opinion coincides with his, since there is much variation in the dentition of this species. Figure 67 *d.* represents the teeth of the upper jaw in a specimen referred to *ophis*, and described in the "Ichth. of the Voy. of the Ereb. and Terr.," as quoted above.

175. Poecilophis catenatus.

Murœna catenata, *Rich., Ereb. & Terr.* p. 95.
Gymnothorax catenatus, *Bloch*, t. 415; *Syst.* 528.
Murænophis ondulè, *Lac.* v., 19, 2.

Nasal teeth biserial, conical, bluntish, about 12 in each row, set alternately, and enclosing a horse-shoe-shaped area, the posterior ones being the stoutest, but none of them high. From 2 to 4 stout conical teeth on the mesial line; and in one colourless specimen, these teeth, and those of the inner marginal row, are so large as nearly to fill the entire disk. Vomerine teeth biserial, small, and rounded, of different sizes. Palatine teeth also biserial, 12 or 13 in each row; the outer ones low, even, and bluntish, scarcely rising above the soft parts; the inner ones higher, conical or conico-subulate, and not so closely set: the teeth of both rows smaller than the nasal ones. Mandibular teeth likewise biserial,

each limb having 22 in the outer row, which are closely set and deeply imbedded in the soft parts; those of the inner row are a little higher, but equally blunt. The two rows are contiguous posteriorly, but separate a little towards the front of the jaw, where the inner teeth are stouter, and somewhat wider apart. On the tongue-bone there are 12 acute recurved teeth, and a second series of 4 on the tip of each branch of the bone.

Posterior nostrils have slightly-raised black borders. In the orbital region four deeply-seated pores in white spots; also two pairs near the anterior nostrils, four or five on each limb of the mandible, and one in the symphysis of that bone. Anus in the middle of the fish. Dorsal commencing a short way before the gill-opening.

The fish is crossed by about twenty-six narrow yellow stripes, which pass over the dorsal fin and down the sides. Three of the stripes, placed before the gill-opening, form meshes with each other, and some of the posterior ones are interrupted, their upper and under halves alternating. They are most regular before the anus, where they slope forwards as they descend to the belly, and more irregular and wider on the tail. All of them are more or less spotted with the blackish ground-colour.

Length, 24·5 in. To anus, 13·5 in. To gill-opening, 3·5 in. (*Richardson.*)

Bermudas. Caribbean Sea. South America.

The British Museum possesses a handsome specimen brought from Trinidad by J. B. Jukes, Esq.

176. Poecilophis polyzonus.

Muræna polyzona, *Rich., Voy. of Sulph.* p. 112, pl. 55, f. 11–14.
Muræna sordida, *Cuv., Règ. An.* 11, 352; *Seba.* ii., 69, 4.

Diagn. From twenty-six to twenty-nine yellow rings, which dilate a little on the ventral surface, but do not actually close there.

Nasal teeth biserial; the outer row composed of minute rounded teeth; the inner one of taller, rather bluntish, conical ones. Two conical teeth on the mesial line of the disk, somewhat taller than the marginal ones. Vomerine teeth anteriorly biserial, posteriorly covering a wider surface, with three or more irregular rows. Palatine teeth biserial, the rows coalescing behind; outer row consisting of very minute, low, flattish teeth; inner one of taller, slenderly-cylindrical teeth, having moderately-acute cusps; there are 7 or 8 in each row. Mandibular teeth biserial: the teeth of the outer row being by much the smallest, and gradually becoming less as they approach the corner of the mouth; those which form the inner row taller, with conical cusps, two or three near the fore end of the jaw being larger than the rest. The outer row of each limb contains 18 or 19 teeth, the inner one about 12.

Gape small; margin of the posterior nostril tumid, the anterior nostril being, as usual, tubular; body much compressed; and the anus situated about the thirty-fifth part of the whole length before the middle of the fish.

Length, 9·35 in. To anus, 4·41 in. To gill-opening, 1·15 in.

Place of capture unknown. (*Richardson.*)

β. Species more of one colour.

177. Poecilophis Peli, fig. 68.

Poecilophis Peli, *Kaup.*

Head short and blunt; the small hinder nostril-tubes bordered with white. Two pores above the short front nasal tubes; five on the upper jaw, and six on the mandibular lip, all placed in white disks. Tail shorter than the rest of the fish, or as long as the distance from the corner of the mouth to the anus. Colour blackish, with innumerable yellowish-brown freckles on the dorsal fin and along the back. A black, interrupted longitudinal stripe on the dorsal, together with rows of yellowish points.

Nasal teeth 13, 3 smaller ones interposed among the hinder 3. On the mesial line 3, the last of them the thickest. Vomerines disposed in two rows, which join the mesial and nasal ones. The rudimentary palatine bone armed with two irregular rows of somewhat pointed and more elongated teeth. Mandibulars 16; 9–11 on the fore half on the outside.

Gold Coast of Africa (Leyden Museum. From M. Pel).

178. Poecilophis delicatulus.

Poecilophis delicatulus, *Kaup.*

Nasal teeth 13, in a half circle; 2 on the mesial line. Vomerine teeth large and compressed laterally, in two rows, 8 on the left, 6 on the right side. Palatine teeth, 14 shorter ones in the outer row, 10 larger ones in the inner row. Mandibular teeth, 14 in a lateral row, and 11 forming an exterior anteriorly. Ground-colour black, with extremely fine and irregular reticulations.

Total length, 7·87 in. Length of tail, 3·74 in.

Moluccas (Leyden Museum).

179. Poecilophis fascigula.

Muræna fascigula, *Peters.*

Nasal teeth, one row in front, two laterally, conical. Palatines bisérial, smaller, and more obtuse. Vomerines, one row in front consisting of conical teeth: behind, rounder: at the commencement the vo

merines make three rows; at the end they form four. Mandibulars biserial, more obtuse and triserial at the corner of the mouth. Snout longer than the mandible; and the eye situated over the middle of the jaw. Anus in the middle of the whole length. Dorsal equal in height to one-fourth the depth of the body, and twice as high as the anal. Colour dark umber; the ventral aspect bluish-white. A black spot at the corner of the mouth. Black longitudinal lines on the head and throat, and some white rings on the end of the tail.

Total length, 14·76 in. Diameter of the eye, 0·196 in. To the corner of the mouth, 0·78 in. To the gill-opening, 2·04 in. To the dorsal, 1·61 in. To the anus, 7·67 in.

Mozambique (from Dr. Peters).

180. Poecelophis Lecomtei.

Poecilophis Lecomtei, *Kaup.*

Approaches *Peli* very closely, but is separated from it by the absence of the white disks round the pores, and by the hinder nostril-tube being directed more backwards than forwards, and by its being proportionally bigger. Colour black, ornamented along the body by yellowish-brown occellated spots and marks like hieroglyphics.

Another specimen shows only a few yellowish-brown points, and a very young individual is bedecked above and below by longitudinal rows of points.

Gaboon. Africa, (Paris Museum. From M. Aubry Lecomte).

Genus 37. GYMNOMURÆNA, *Lacépède.*

Destitute of all the fins. Nasal teeth blunt, tessellated. The teeth of the mesial line, and of the vomer, form, by their aggregation, a figure resembling the sole of a shoe. Rudimentary palatine bones furnished with small toothlets disposed in two or three rows. Body elongated and crossed by white bands.

181. Gymnomuræna fasciata, fig. 69.

Murænophis fasciatus, *Hardw. Icon. ined. in Mus. Brit.*

Differing greatly from the more common *G. zebra* (182) by its greater number of round, blunt teeth in both jaws. The nasals and vomerines cover a larger space, which has the form of the sole of a hunter's shoe. The large specimen in the British Museum measures 27½ in. in length, of which the tail constitutes 15¾ in. There are from 100 to 114, more or fewer, interrupted cross-bars on a dark ground-colour. Muscat (Paris Museum, by M. Lelaucher.) The speci-

men in the British Museum, presented by the Zoological Society, is of unknown origin. Hardwicke's drawing was executed in India.

182. Gymnomuræna zebra, fig. 70.

Zebra eel, *Shaw, Nat. Misc.*
Gymnothorax zebra, *Bloch, Schn.* 528.
Le gymnomuræna cerclée, *Lac.* v., 649, pl. 19, f. 4. *An.* 1803.
Gymnomuræna zebra, *Rich., Ereb. & Terr.* p. 95.

All the teeth low and flatly rounded, the larger ones having generally one or two grooves, with an intervening, acute, transverse ridge on their crowns. Nasal teeth biserial; the outer row composed of 14 or 16 very low teeth; the inner row of 12 or 14 considerably larger and more prominent ones. These rows enclose a circular area, which is filled by 6 round teeth in two rows. The dental surface of the vomer has an oval shape, and there are eight rows of teeth in its middle, which narrow off to two before and behind. The anterior ones are in contact with the mesial nasal ones. The palatine teeth reach only about half-way to the corner of the mouth, the space beyond them being filled by a smooth thick fold of skin. On the mandible the teeth extend to the extreme corner of the mouth, being opposed posteriorly to the fold of skin just mentioned. They stand in four rows before the corner of the mouth, narrow to three near the middle of the limb, and on the anterior third of the jaw form only two distinct rows, though some very minute teeth may be detected at the base of the outer row. The inner row at the end of the jaw is composed of 7 teeth on each limb, larger than the rest, and rendered still more prominent by a curve of the jaw. In this part of the jaw the inner rows of the two limbs are in close contact, and cannot be separated. When the mouth is closed, these teeth are pressed against the equally prominent nasal ones, the posterior teeth of the two jaws being kept thereby some distance apart.

Eye small, considerably before the middle of the gape. Posterior nasal orifice having an elevated border, and placed a little before the eye. Anterior one shortly tubular. Dorsal fold of loose skin extending forward to the nostrils, too thick to allow the rays to be either seen or felt. Body compressed, the compression augmenting towards the tip of the tail, which is not acute, though it tapers. Anus in the posterior third of the length.

Ground-colour brown, with seventy-four white rings, some of which are not complete, and some unite before they reach the ventral surface, but the greater part are regular, and are all nearly of the same width.

This description is taken from Shaw's specimen, which was presented by the College of Surgeons to the British Museum. The backward position of its anus and other characters seem to point it out as a distinct generic form from *Muræna*. (*Richardson.*)

Length, 30 in. To anus, 21 in. To gill-opening, 2·6 in.

Sumatra (*Shaw*) New Britain (*Commerson*). Madagascar (*Quoy and Gaim.*).

Genus 38. APTHALMICHTHYS, *Kaup.*

This group resembles *Moringua* (Gen. 41), but its members have no fins except a mere trace at the point of the tail. Eyes covered by a skin. Mandible thick and elongated beyond the snout. Nostrils short and tubular, the posterior one capable of being closed. The tail does not taper, being nearly as thick at its extremity as near the anus. On the upper jaw there are 11 teeth, the longest of which are the 7 nasal ones. Mandibulars, 10–12.

183. Apthalmichthys javanicus, fig. 71.

Apthalmichthys javanicus, *Kaup.*

A greatly-elongated, vermiform eel, which is very common in the Sea of Java. With a height of 0·432 or 0·473 in., it has a length of 36·13 in. The tail is 10·24 in. long; and the distance from the tip of the snout to the gill-opening is 1·93 in.

Java (British and Leyden Museums).

Genus 39. UROPTERYGIUS, *Rüppell.*

Uropterygius, *Rüpp. Neue Wirbelthiere*, 83.
Muræna, *Bleeker.*

Two rows of fine teeth in both jaws, those of the outer rows being short, with recurved points; while those of the inner rows are straighter and more than twice as high. On the vomer one row of 7 pointed and recurved teeth. The only fin is on the somewhat expanded tip of the tail.

184. Uropterygius unicolor.

Uropterygius unicolor, *Rüpp.* t. 20, f. 4.
Muræna microptera, *Bleeker, Murænoiden.*

This fish is a near ally of *Muræno-blenna tigrina* (No. 173), but is separated from *Muræno-blenna* by possessing 3 fixed nasals, two rows of palatines and mandibulars, and also two rows of vomerines I am acquainted with three specimens from the Isle of Bourbon, belonging to the Paris Museum, which, notwithstanding the specific appellation, are not of one colour only, but are black, with innumerable fine yellow points and scratches. A blackish line runs lengthwise over the operculum, and on the border of both jaws single small

blue spots enclosed in black. Dr. Rüppell says that the front long tooth on the mesial line is a vomerine tooth. He obtained his specimen at Massaua.

Genus 40. APTERICHTHYS, *Dumeril.*

Cæcilia, *Lacépède.*
Sphagebranchus, *Bloch, Cuv.*

No fins. Snout elongated beyond the mandible. The openings of the gills near to each other, as in *Sphagebranchus*. The anterior and posterior nostrils tubular. Body much elongated. Tail slender. Teeth acicular, curved, and uniserial on all the bones.

185. Apterichthys cæcus.

Apterichthys cæcus, *Dumeril, Delaroche, An. du Mus.* t. 13, pl. 21. f. 6.
Cæcilia Branderiana, *Lacép.* i., 2, p. 135.
Sphagebranchus cæcus, *Bloch, Schn.*, 505.
Muræna cæca, *Linn. Syst.* 426.

Colour, an uniform brown, with some blackish spots on the head. Anus situated nearer to the tip of the snout than to the end of the tail.

Ivica. Balearic Islands.

Genus 41. MORINGUA, *Gray.*

Greatly-elongated *Muræna* with the mandible longer than the snout. Teeth distinct, acute, and recurved. Vomerines uniserial. Dorsal and anal fins commencing behind the anus, then disappearing for a space, and recommencing again, and becoming higher than before at the end of the tail, which they surround.

186. Moringua raitaborua.

Anguilla (Moringua) raitaborua, *Cantor, Nat. Tyd. Batavia*, 1853, pl. 1.
Rataborua Hamiltoni, *Gray, Zool. Misc.* 9.
Rataborua Hardwickei, *Gray, Ill. Ind. Zool.* 11, f. 2.
Muræna raitaborua, *Ham. Fish of Ganges*, 25-364 (*juv.*).
Muræna raktaborva, *Ham. MSS. drawings* (*juv.*), (from this Hardwicke's figure has been copied.)
Moringua linearis, *Gray*, l. c. t. 11, f. 1.
Pterurus maculatus, *Swainson, Nat. H. Fish.* ii., 334. f. iii. b.

Pachyurus linearis, *Swainson, Nat. H. Fish.* ii., 335, f. iii. c. c.
Ptyobranchus arundinaceus, Pt. Guthrianus (adult) et Pt. brevis (young), *McClell. Calc. Journ.* v., pp. 200, 202, 221, 223, pl. ix., f. 3-6, pl. x., f. 1, 2.

An old fish, has during life pale reddish-brown head, cheeks, and throat, thickly bedecked with black or liliaceous spots; the back and sides, down to the lateral line, pale greenish or grayish olive, stippled with black or lilac; the pectorals, pale carmine-red; the fore-part of the dorsal and anal fins, whitish; the hinder part of these fins and the caudal, black. The belly is smutty, reddish-white, stippled with orange, and the tail spotted with black or lilac. The eyes are black.

After death the head and back are carmine, aspersed here and there by greater or lesser spots. In this condition it constitutes McClelland's *arundinaceus* and *Guthrianus*.

When completely grown, this fish reaches a length of 26 or 27 inches. The collection of synonyms is due to the researches of the very able Indian ichthyologist, Dr. Cantor.

187. Moringua bicolor.

Moringua bicolor, *Kaup.*

Like *raitakarua*, this species possesses small but distinct pectorals, but it differs in its colours, and in having the dorsal and anal fins of equal lengths. They commence on the third part of the tail. Upper jaw longer than the snout. Teeth pretty long, acute, and recurved; 9 in the upper jaw, 6 on the mandible.

Colour of the upper aspect and end of the tail, dark, with traces of bars and spots; the lower aspect is silvery.

Length, 14·15 in. Length of tail, 4·25 in.

Timor (Leyden Museum).

188. Moringua lumbricoides.

Moringua lumbricoides, *Gray, British Museum.*

This species has a great resemblance to the one which immediately follows, but has a larger mouth, a more suddenly tapering snout, and merely rudimentary pectorals, which can be seen only through the assistance of a lens. The anal does not begin close to the anus, but is more conspicuous than in *lumbriciformis*, as is also the dorsal. The eyes are not so easily seen as in the species just named. It is altogether a more slender fish, with a shorter tail. Length, 10·55 in. Length of tail, 3·66 in.

China (British Museum, R. Reeves, Esq.).

189. Moringua lumbriciformis.

Moringua lumbriciformis, *Kaup.*

A round-bodied species, with an extremely short head and pointed

snout, which is equalled in length by the mandible. Lateral line distinct, undulated in its course. Anal fin beginning directly behind the anus. Fins very short and low, and conspicuous at the tip of the tail only.

Length, 10·04 in. Length of tail, 3·78 in.

India (British Museum, from General Hardwicke).

Family III.—CONGERIDÆ.

The members of this family possess a dorsal which commences close to the occiput, a naked skin, destitute of scales, and for the most part a longish, pointed, projecting snout. Some have, others want, the pectoral fins.

Genus 42. CONGERMURÆNA, *Kaup.*

Posterior nostril, an oblong opening, situated longitudinally near the large eye, which is placed over the angle of the mouth. Teeth flatly rounded in numerous rows.

190. Congermuræna habenata, fig. 72.

Congrus habenatus, *Richardson, Ereb. & Terr.* p. 109, pl. 50, f. 1–5.

This species differs from the preceding ones in its dentition, the teeth on the roof of the mouth being fitted for crushing or grinding the food.

Body thicker than the head, nearly cylindrical, its height exceeding its transverse diameter only by one-fifth, the compression augmenting rapidly between the anus and tip of the tail. The muscular flakes are very visible through the smooth, shining, silvery skin; and the lateral line, gradually descending from the nape to the middle height, which it attains some way behind the anus, is marked out by a series of pores, commencing at the occiput. A depression, descending from the occiput, separates the muscles of the cheek from the gill-cover. The eye is large, encroaches on the profile, and is contained rather less than four times and a half in the distance between the end of the snout and the gill-opening. The space between the eyes is less than the vertical diameter of the eye-ball. Snout rather broad and obtuse. A mesial fold of loose skin, uniting with the upper lip, gives a bridled appearance to the snout. The posterior nostril is open, and is situated just before the eye; the anterior one is a short tube, placed on one side of the tip of the snout. The under jaw is shorter than the upper one, and the gape of the mouth is cleft to beneath the centre of the eye. The upper lip, commencing just behind the tubular

anterior nostril, runs back to the angle of the mouth, where it curves over the end of the lower lip to be inserted into the lower jaw. It is continuous with the integuments which cover the preorbitar and suborbitar chain, and is separated interiorly by a deep furrow from an inner lip or swelling gum, which runs along the base of the palatine teeth. Three small cartilaginous bodies are imbedded in that part of it which is attached to the preorbitar, and are seemingly connected with pores on the edge of the lip. The under lip is broader and folds back on the sides of the lower jaw, but runs evenly to the roots of the teeth, without any interior furrow as in the upper lip. Conspicuous pores exist on the end and top of the snout, on the upper lip, the suborbitar chain, across the head behind the orbits, on the hinder part of the mandible, and across the occiput, where they connect the lateral lines with each other.

The nasal teeth are conico-subulate, short, and acute, and stand in a small, dense, triangular cluster, on the point of the jaw, anterior to the apex of the mandible when the mouth is closed. They are followed, without an interval, by four rows of flatly-rounded vomerine teeth, the middle rows containing the largest ones. The vomerine teeth extend as far back as the front of the eye. The palatine bones are armed by an even, outer series of somewhat subulate, but not very acute teeth, with interior, rounded, granular ones considerably lower, and about three deep, but not ranged in determinate rows. The mandibular teeth are similar to the palatine ones, but the dental surface increases gradually in width from the corner of the mouth to the symphysis, where the teeth are five or six deep. Tongue smooth.

The distance between the end of the snout and the gill-opening is equal to one-sixth of the total length, and the anus is a little anterior to the middle of the fish. The dorsal commences over the axil of the pectoral or lower angle of the gill-opening, and its rays are more delicate and crowded towards the end of the tail, where it unites with the anal. The pectoral is rather small.

The stomach is cœcal, wide, and obtuse, and, in the individual here described, was completely filled by a large shrimp, which was doubled up, and but little broken. It has no small appendix such as exists at the fundus of the stomach of the *Conger vulgaris*. The gut goes off from a funnel-like recess at the upper end of the stomach, and descends straight to the anus, being bound to the stomach by membrane as far as that viscus extends. The stomach and rather more than half the gut were of a purplish-black colour, apparently proceeding from their contents, the under part of the canal, below the fundus of the stomach, being pale. The air-bladder, long and slender, descends as low as the anus: its lower end tapers, and its upper one divides into two tapering branches, one of the branches being continuous with the tube which communicates with the œsophagus. The heart and pericardium have a shining nacry appearance, and are connected to each other by strong membranous bands. This individual was killed when spawning, its belly being full of

roe, and the eggs were in the act of passing through the distended anus. (*Richardson.*)

Length, 12·7 in. To anus, 5·7 in. To gill-opening, 2·1 in. Height of body, 0·75 in. Thickness, 0·60 in.

Cook's Strait, New Zealand (*Dr. Hooker*).

191. Congermuræna balearica.

Muræna balearica, *Delaroche, An. du Mus.* 13, p. 137, t. 20, f. 3.
Conger Cassini, *Risso, Hist. Nat.*, p. 203; *Ichth.* 91, 3.
Echelus ciuciara, *Rafinesque.*
Conger microstoma, *Castelneau*, pl. 43, f. 4.

Teeth not so flatly round, and more acute, than in the preceding. Dorsal commencing over the gill-opening. Colour a beautiful shining green, dotted with black.

Rays: D. 89; A. 50;=139; P. 11. (*Risso.*)

Total length, 14·57 in. Length of tail, 7·48 in.

This species is spread widely through the world.

192. Congermuræna mystax.

Muræna mystax, *Delaroche, An. du Mus.* 13, t. 23, f. 10.
Conger mystax, *Risso*, 203.

Much resembling *balearica*, but having a more elongated head, and more fully developed lips. The tip of the pectoral, laid back, reaches to the beginning of the dorsal.

Common at Barcelona, where it is called *Conger sierpe.*

Genus 43. UROCONGER, *Kaup.*

Anterior nostrils not tubular, posterior ones in form of slits, situated near the eyes. Along the margin of the upper lip a row of short slit-like pores. Teeth similar to those of *Myrus*, very fine, and standing in two or three rows. Nasals and palatines biserial. The front teeth penetrate and pass through the upper lip in a very irregular way. Pectoral small and elongated. Gill-openings unusually large.

193. Uroconger lepturus.

Congrus lepturus, *Rich., Ichth. Voy. of Sulph.* p. 106, pl. 56, f. 1–6; *Id., Ereb. & Terr.* p. 109.

Teeth acicular. The nasal ones disposed in two rows of 5 each, the posterior outer one on each side being the tallest. The vomer is armed in front by 2 teeth, like the latter one, one before

the other. The palatine teeth are biserial, the rows being regular, with a space between them and the inner row rather taller and abutting against the nasal disk before the vomerine teeth. Mandibular teeth like the palatine ones, and biserial, but at the symphysis there are three rows, the posterior row being formed by 4 acicular teeth behind the other two rows. Lower jaw nearly as long as the obtuse snout. Dorsal commencing over the axilla of the pectoral. Gill-openings rather large, the space between them on the throat about equal to the length of one opening. Colour bluish-gray above, pale or whitish below; the fins pale and edged with black. (*Richardson.*)

Length, 9 in. To gill-opening, 1·05 in. To anus, 2·7 in. To dorsal, 1·15 in.

China Seas (*Sir Edward Belcher*).

Genus 44. CONGER, *Cuvier.*

Anterior nostrils issuing near the end of the snout in short tubes; posterior nostrils opening before the large eyes. Palatine and vomerine teeth slender, but chisel-shaped at the points, and standing so closely in a line as to produce an incisorial edge.

194. Conger vulgaris.

Conger vulgaris, *Cuv. Règn. An.* 2.
Congrus vulgaris, *Richardson, Ereb. & Terr.* p. 107.
Congrus leucophæus, *Id.*, p. 108.
Muræna conger, *Bloch*, 155.

Diagn. The pectoral, when laid back, passes by a third part of its length the commencement of the dorsal. Head depressed. Diameter of the eye contained twice in the length of the snout, and once and a half in the height of the head, measured on a line passing vertically through the pupil.

The skull of the common Conger of the British Channel has much the same shape posteriorly with that of *Muræna*, but the hypotympanic pedicle of the lower jaw inclines forwards, so that the strong bony preoperculum, and equally large but thinner interoperculum, do not project backwards beyond the occiput. The operculum, which is also strong and moderately large, has a deep crescentic notch in its upper border, embracing more than a quarter of the otherwise circular circumference of the bone. The narrow meniscoid suboperculum borders the under half of the operculum. Taken together, the gill-plates and the branchiostegous rays are not inferior in size and strength to those of many acanthopterygian fishes, and far exceed the delicate and diminutive opercula of the

Muræna. A bone, which may be considered as the confluent pterygoid and entopterygoid, and which does not exist in *Muræna*, has the shape of a long plate, forming the floor of the orbit. Its anterior end joins the prefrontal process of the vomer underneath the groove, for lodging the olfactory nerve, and its posterior end is partly confluent with the hypotympanic, partly joined to it by suture. The palatine, as in *Muræna*, performs the ordinary function of the maxillary bone, but it is shorter and stronger than in that genus, and is articulated by a flat head to the side of the vomer and hinder part of the small nasal disk, at the fore part of the olfactory sac, close to the end of the snout, the prominent tip of the snout being formed by the nasal disk or chevron. In *Muræna*, the articulation of the end of the palatine with the preorbital process of the confluent vomerine and nasal bones is just at the border of the orbit. In the common Conger, the large triangular preorbitar flanks the end of the snout, covering the anterior third of the palatine. The rest of the suborbitar chain remains in the condition of a cartilaginous tube, except a short piece at the posterior inferior angle of the orbit, which is ossified. The integuments of the side of the snout, and part of the upper lip, are strengthened by a tough ligamentous substance, approaching to cartilage in firmness. The *Congrus mystax* is described by Laroche as having two transverse bony rays in the upper lip of each side, but I cannot help suspecting that he alludes to the preorbitar and the posterior ossified portion of the suborbitar chain. In *Congrus communis*, the uro-hyal is a strong bone, nearly cylindrical in the middle, dilated anteriorly, where it is attached to the basi-hyals, which are confluent with the stout cerato-hyals, and compressed posteriorly at its connection with the lower points of the firm, well-developed coracoid bones. The gill-rays, nine in number, are also strong and rigid, except towards their points, and all the parts of the hyoid bone and humeral arch are much firmer and stronger than in *Muræna* or *Ophisurus*.

The stomach is a long, thick, cylindrical sac, with a short, narrow, slightly-tapering, obtuse, cœcal process at its fundus. The pyloric orifice is near the top, leaving eleven parts of twelve in the length of the viscus beneath it, and the canal passes obliquely through the coats of the stomach, ascending till it reaches externally the junction of the œsophagus; it then makes a sudden turn, and runs downwards along the back of the stomach, a valve being formed at the curve by an inflection of the inner coat of the gut. At the lower quarter of the stomach, the gut, still tied down to it by a short mesentery, makes three loops, which, together with five or six valvular inflections of the inner coat at the several curves, perform in some degree the functions of a spiral valve, by detaining the alimentary matters in their passage, and giving increased surface for absorption. The guts ends in a short, straight, and rather wider canal, which arrives at the anus very soon after passing the cœcal point of the stomach.

The end of the snout is formed by the rounded extremity of the

nasal bone, whose dental disk, nearly twice as broad as it is long, is closely set with small, short, stoutly subulate, acute, somewhat recurved teeth. A smooth furrow separates this disk from the rather prominent elliptical dental surface of the vomer, which is armed with similar teeth, but which are less crowded on the mesial line. The vomerine teeth do not go so far back as the prefrontal process. The principal series of teeth on the palatines, when looked at *in situ*, appear to be slenderly cylindrical, somewhat like the teeth of a *Chætodon*, but they are in fact wedge-shaped, being transversely wider at the base, and obliquely chisel-shaped and acute on the edge. Being very closely and evenly set, the series as a whole is incisorial. Close to their roots interiorly a few minute teeth may be detected, situated so as to be ready to replace any of the main series that may be injured; and at a very small interval there is a very low, even row, forming an interior acute ridge, just visible above the soft parts. Near the symphysis this ridge terminates in a narrow band or cluster. On the outside, near the anterior end of the palatine bone, the main dental ridge is supported by a villiform band of small subulate teeth, which is broadest where it touches the nasal disk, and tapers off to a point posteriorly, not reaching above one-third of the length of the bone. The mandibular teeth are similar to the palatine ones, but the outer villiform cluster at the symphysis is broader. The small inner teeth of both jaws are concealed by the soft parts in the recent fish. The upper and under pharyngeals are densely covered with very fine villiform teeth, which are slightly coarser on the inner borders of the bones.

The pretty large, ovate pectoral is supported by seventeen rays. The dorsal commences over the last quarter of the pectoral, and contains about three hundred rays, while the anal is supported by two hundred and fifty. They are bordered with black, as is the case in the majority of Congers. The lateral line has a series of white pores beneath it. (*Richardson.*)

Length from 5 to 7 or 8 feet.

European Seas.

195. Conger niger.

Conger niger, *Risso, Hist. Nat.* 201.
Echellus macropterus, *Rafinesque, Caratteri*, 64, 165.

The pectorals, though proportionally longer than in the common species, do not reach to the commencement of the dorsal. Eye larger, and more oval, its diameter exceeding half the length of the snout. Head longer than in *vulgaris* (194), and the lips more developed. According to Risso, the dorsal aspect is black, and the ventral surface soiled white. This species does not attain the great size of *C. vulgaris*.

Total length, 22 in. Length of tail, 1·25 in. Diameter of the

eye, 0·51 in. To the corner of the mouth, 1·22 in. To the pectoral, 1·06 in. To the beginning of the dorsal, 4·55 in.

Mediterranean Sea.

196. Conger altipinnis.

Conger altipinnis, *Kaup.*

This species also closely resembles the common Conger, but the single spotted pectoral reaches beyond the commencement of the dorsal, which is unusually high, so that its height is equal to the length of the mouth. The tail is more obtuse than that of *vulgaris*, and the caudal is very long, being equal to the length of the mouth.

Total length, 18·86 in. Length of tail, 11·79 in. Length of pectoral, 0·78. Length of the mouth, 0·78 in.

Isle of Bourbon (Paris Museum).

197. Conger marginatus.

Conger marginatus, *Valenc. Eyd. et Soulcy. Bonite*, i., p. 201, pl. 9, f. 1.

Dorsal commencing nearly as far forward as the base of the pectoral. The head is less depressed than that of *vulgaris*, and the diameter of the eye is contained twice in the height, and also in the length of the head. The vomer is armed by a short cluster of not more than four rows of teeth. Front mandibular teeth, like those of *occidentalis* (199). General colour, greenish, with the black spot on the pectoral, and black edging of the fins as in all the others.

Total length, 31·49 in. Length of tail, 19·98 in. Greatest height of body, 2·51 in. Length of the mouth, 1·55 in.

198. Conger multidens.

Conger multidens, *Castelnau, Voy.* pl. 44, f. 1.

Diameter of the eye half the length of the snout. Dorsal commencing the length of the pectoral behind the tip of that fin. Colour of the upper aspect of the fish, greenish, of the ventral aspect, silvery. Nasal teeth disposed in five irregular rows. Two rows of vomerine teeth, uniting to form a single row, the inner row composed of 6 teeth, the outer row of only 2 or 3 teeth. This is a slender species.

Total length, 27·94 in. Length of tail, 17·28 in.

South America.

199. Conger occidentalis.

Conger occidentalis, *Dekay, Fauna of N. York* 172; *Mitchill, Tr. Lit. & Phil. Soc.* i., p. 360.

Dorsal commencing a very little beyond the end of the pectoral. Diameter of the large eye equal to half the length of the snout. Vomerine teeth 9, small and irregularly placed. Mandible naked at the symphysis, its branches covered anteriorly by four rows of short teeth.

Total length, 35·43 in. Length of tail, 20·84 in.

Martinique (Paris Museum). New York (*Mitchill*).

200. Conger Verreauxi.

Conger Verreauxi, *Kaup.*

Tip of the narrow pectoral falling short of the commencement of the dorsal. Colour of the fish, black, with a brownish lateral line.

Total length, 12 in. Length of tail, 0·74 in. To the gills, 1·56 in. Length of pectoral, 0·47 in.

201. Conger brasiliensis.

Conger brasiliensis, *Kaup.*

Comes near to *C. vulgaris*, but the dorsal begins nearly a length of the pectoral beyond the tip of that fin. Vomerine teeth lying close to the nasals, and beginning of the palatines, and running into an acute angle on the roof of the mouth. The large eye is contained once and a half in the length of the snout.

Total length, 27·90 in. Length of the body, 9·82 in. Length of the tail, 18·08 in.

Brazils.

202. Conger Orbignyanus.

Conger Orbignyanus, *Valenc. d'Orbigny, Voy.* t. 12, f. 1.

Dorsal low and commencing the length of the pectoral behind the tip of that fin. Diameter of the eye a little less than half the length of the snout, and equal to the height of the dorsal.

Total length, 26·37 in. Length of tail, 16·12 in. Length of the mouth, 12·99 in. To the eye, 9·45 in. To the gill-opening, 3·70 in. Length of the pectoral, 9·84 in.

Genus 45. MURÆNESOX, *McClelland.*

Having the snout elongated like that of the Gavial, and its nasal bone dilating like the bowl of a spoon, and projecting beyond the mandible. The thin lips do not cover the front teeth. Fore nostrils issuing in short tubes near the narrowed part of the nasal

bone. Hinder nostril open, tolerably remote from the large eye which is placed nearly in the middle of the jaws. Dorsal extending forwards, beyond the origin of the pectoral. The vomer rises upwards, and its larger teeth stand in a furrow, accompanied by smaller blunt ones. Several rows exist on the palatines, and also on the mandible. The longest teeth are implanted in the nasal bone and fore part of the mandible.

The species of this group attain a considerable size, and are very rapacious.

203. Murænesox pristis.

Murænesox pristis, *Kaup.*
Conger talabon, *Cantor & Bleeker* (*nec Russell, nec Cuvier*).
Murænesox lanceolatus, exodon, serridentata, exodonta, *McClelland, Calc. Journ. Nat. Hist.* iv., 409, v., 180-1; *Cantor, Mal. Fish*, 1294.

Diameter of the eye contained two and a half times in the length of the snout. Vomerine teeth tall, round, and pointed, without distinct lobes. In old age, the external mandibular teeth stand outwards, like the saw of a *pristis*. Anterior nostril removed from the orbit to a distance equal to twice the diameter of the eye. A skin of this species, preserved in the Paris Museum, exceeds 79 in. in length. Two specimens in the Leyden Museum are of middle size.

Indian Ocean.

Russell gave the following species the name of *talabon*, which Cuvier adopted; but as that has also a second name of *bagio*, I have described it under that appellation, and to avoid the confusion occasioned by Cantor's and Bleeker's use of the word *talabon*, I have designated the last species by the name of *pristis*, because the outer mandibular teeth are directed outwards, like the teeth of a saw. None of McClelland's various names conform with the specific character so well as mine.

204. Murænesox bagio, fig. 73.

Conger talabon, *Cuvier, Règn. An.* 11, 350; *Russ. F. of Malab.*
Conger bagio, *Cantor, Mal. Fish.* 316.
Muræna bagio, *Ham. Fish of the Gang.* 24, 364.
Murænesox tricuspidata, Hamiltoni (bagio) bengalensis, *McClelland, Calc. Journ.* iv., 409, pl. 24, f. i. a. b.; v., 182, pl. 8, f. 3, and pp. 210, 182.
Congrus tricuspidatus, *Richardson, Voy. of Sulph.* p. 105, pl. 51, f. 2; *Ereb. & Terr.* p. 110.
Conger hame, *Temm. & Schl. F. Jap.* 262, pl. 94, 2; *Ereb. & Terr.* p. 111.
Conger oxyrhinchus, *Eydoux et Souleyet, Bon.* t. i., 203, pl. 9, f. 2.
Ophisure longmusean, *Quoy & Gaim. Voy. Freyc.* pl. 51, f. 1.

Diagn. Exterior row of mandibular teeth not pointing outwards.

The length of the snout and the dentition vary with age in this species; but the head is never so much elongated as in *pristis*. When its jaws are shut, the front mandibular teeth are concealed, which is never the case with *pristis*. After examining a great number of Indian specimens, I have come to the conclusion that the so-called species which I have ranged as synonyms of *bagio*, are merely nominal.

Chinese and Indian seas and estuaries.

205. Muræsox savanna, fig. 74.

Conger savanna, *Cuv. Paris Museum.*
La Savanne de Martinique, *Cuv. Règn. An.* 11.
Conger limbatus, *Castelneau.*

The skin of the exceedingly broad snout is rendered uneven by pits, which vanish towards the belly. A row of pores, running up before the eye to the forehead, makes there a sharp angular inflection, and takes its course to the fore nostril-tube. The diameter of the eye measures less than half the length of the snout. The longest teeth are two pairs of nasals, and the corresponding mandibulars. The vomerines, together with the principal row of palatines, and the mandibulars, are compressed laterally and rounded at the point. All the rest of the teeth are very short and blunt. The fins are greatly developed.

Rays: Br. 17; D. 237.

South America (Museums of London, Paris, and Leyden).

The following species require to be more closely examined in order to ascertain their true position.

206? Congrus curvidens, *Rich.*

Congrus curvidens, *Rich., Ereb. & Terr.* p. 111.

Nasal teeth stoutly subulate, stronger than in other species, ranged in a cluster without order, the tallest in the middle, followed on the mesial line by 4 minute round ones in two rows, which may be considered as the anterior vomerine ones. The mesial row of tricuspid vomerine teeth, placed on the ridge of the bone, which is arched, have oblique curved cusps, and are close set. The lateral cusps are small, round, and at the root of the tooth. In the posterior teeth the central cusps are worn down to the level of the lateral ones. Small teeth on each side of the principal series, rounded, not compressed, and of unequal sizes, not disposed in rows, and seldom more than two abreast. Palatine teeth of the principal row rounded on the crowns, but generally with a mesial acute line: there is an irregular row of minute granular teeth on the outside, and a band of 2 or 3 on the inside, with a furrow between them and the main series. The palatines abut against the vomer at the sixth tooth. The mandibular teeth, instead of being like the vomerine ones, as in the preceding species, more re-

semble the palatine teeth in the principal series; and there is also a row of uneven granular teeth on the outside, and two irregular rows on the inside. Twelve subulate, but not very acute teeth border the end of the mandible, and there are 2 taller subulate ones within the half circle on each side.

Eye large, placed a diameter and a half of the orbit from the end of the snout, and half a diameter from the corner of the mouth. Lateral line a series of short tubes, each having a porous mouth posteriorly, and beneath an oblong mark. The gill-rays are seventeen; and the dorsal commences over the gill-opening. (*Richardson.*)

Length, 27 in. To anus, 13·5 in. Length of rictus of mouth, 3·5 in.

A dried skin preserved in the British Museum.

Of unknown origin.

207? Congrus brevicuspis, *Rich.*

Congrus brevicuspis, *Rich., Ereb. & Terr.* p. 111.

Nasal disk bordered on its anterior half by about 10 moderately tall and strong subulate acute teeth, and in the middle of the disk there are 9 small conical acute ones, placed so as to represent a cross with short lateral arms. The depression of the vomerine ridge next the nasal bone is considerable. The 9 principal vomerine teeth have short acute middle cusps, with larger rounded lateral ones than in *proterrus*, and they are flanked on each side by a row of compressed, rounded, oblique cutting ones, neither closely nor evenly set. The outer row of palatine teeth is composed of evenly-set, compressed, obtuse cutting teeth and the long elliptical dental plate is wholly covered with innumerable minute rounded teeth, without any smooth space in the middle. The palatines abut against the vomer at the sixth tooth. The mandibular teeth are like the vomerine ones; but they are not so regular, the alternate ones being often, but not uniformly, lower. The outer row is composed of even, close-set, semicircular, sharp-edged small ones, applied to the base of the chief row, and the inner ones can scarcely be detected. The disk, at the end of the mandible, is armed by 5 or 6 acute, subulate, marginal teeth, and 3 taller ones within on each side, the posterior pair being high and stout.

The eye is placed three diameters of the orbit from the end of the snout, and a diameter before the corner of the mouth, whose gape is equal to five diameters of the orbit. The space between the eyes is transversely convex, and its breadth rather exceeds the vertical diameter of the orbit. The pectoral is elliptical and long; and the dorsal commences over the gill-opening.

Colour, in spirits, pale brown above, silvery beneath. The fins silvery and black-edged. (*Richardson.*)

Length, 23 in. To anus, 9¼ in. To gill-opening, 3·4 in. Specimen in the British Museum.

Of unknown origin.

Genus 46. NETTASTOMA, *Rafinesque.*

Murænophis, *Risso.*
Muræna, *Cuvier.*

Is a *Conger*, without pectorals, and with a very elongated snout. The teeth are fine, innumerable, card-like, in many (6–7) rows, increasing in length as their position is more inward and movable. The nasal bone is very short, and its compressed teeth are disposed in a circle; while the teeth of the greatly outstretched vomer increase posteriorly in number and size; they stand in irregular longitudinal rows. Fore nostril issuing in a short cutaneous pipe: hinder nostril an oblong opening situated before and over the eye, and capable of being closed by a skinny process of its upper edge. Eye large, placed above the corner of the mouth. Body cylindrical, and the tail tapering into a very long slender point. Dorsal and anal fins very conspicuous.

208. Nettastoma melanura, fig. 75.

Nettastoma melanura, *Rafinesque-Schmalz*, *Caratteri*, t. 16, f. 1.
Murænophis saga, *Risso*, 193; *Ichth.* f. 39.

This highly interesting fish lives in the most profound depths of the Mediterranean Sea, and can be taken only by aid of a very long angling line. It attains a moderately large size, exceeding 32 inches in length. It has on the upper jaw and round the eye fourteen pores, and on the mandible nineteen; also two pairs on the front of the snout between the fore nostril-tubes, and one pair on the occiput.

According to Risso, it is brown on the back, bluish on the ventral aspect, and red at the tip of the jaws. All the specimens in the Jardin des Plantes have the caudal fin edged with black, as is very frequently the case with the *Congeridæ*. Lateral line double at its commencement, towards the anus beset with pores, and, as it approaches the end of the tail, becoming single.

Rays: D. 310; A. 240; = 550. (*Risso.*)

Length of body, 12·75 in. Length of tail, 9·42 in. Length of mouth, 2·47 in. To the gill-opening, 4·70 in.

Mediterranean Sea (very scarce in Museums).

Family IV. SYNBRANCHIDÆ.

The members of this small family are confined to Asia and South America. Their two gill-openings are so enclosed by a common skinny border that they appear as one externally. They want the pectoral fins and all the other fins, in this respect resembling several genera of *Muræniдæ*.

Genus 47. AMPHIPNOUS, *J. Müller.*

Unibranchapertura, *Hamilton.*
Synbranchus, *Cuv.*

As in *Monopterus*, the gill-openings are separated by a cutaneous membrane. Branchiæ four, the third one having short fringes, the fourth merely traces of notches on its extremity. Teeth, 8 on each row of the vomer, short, curved, and standing rather widely apart. Palatine teeth small and thin, longer on the point of the bone. Mandibulars pluriserial at the commencement, uniserial towards the corner of the mouth.

An occipital cavity holds an air-bladder, which is connected with the gills.* A number of longitudinal raised lines on the body are formed of minute scales. The only trace of a fin is at the slender point of the short, tapering tail.

209. Amphipnous cuchia.

Amphipnous cuchia, *J. Müller, Vergl. Anat. der Myxinoïden; Abh. der Akad. zu Berl.* 1839, p. 244.
Unibranchapertura cuchia, *Hamilton, Fish. of Ganges*, 16, pl. 16, f. 4.
Synbranchus cuchia, *Cuvier, Règn. An.* ii., p. 351; *Swainson*, ii., 336.
Ophichthys punctatus, et Pneumabranchus striatus, leprosus, et albinus, *McClell., Calc. Journ.* iv., 411, v., 192, 219, pl. 13, 195, 196, 219.
Dondoo paum, *Russell; Cantor, Mal. Fish*, 338; *Bleeker, Muræn.* &c.

This fish, says Hamilton Buchanan, is found in rivers and ponds in the south-east parts of Bengal. It is said to grow to two feet in length, and six inches in circumference; but those that I have seen were shorter and thinner in proportion to their length. It is a cylindrical fish, devoid of scales (this is a mistake), and lubricated

* These lung-like sacs were discovered by James Taylor, Esq., Civil Surgeon of Dacca.

with slime. The colour above is dark green, and below a dirty pale red. On every part there are scattered small, round, black spots, and short yellowish bars. Two pale parallel lines run forwards from the shoulder, to the eyes, where they join at an acute angle, two others coming from the sides of the chest. Parallel to the last there are two others on each side beneath the lateral line.

The specimen from India, preserved in the British Museum, is dark green on the upper parts, and soiled white on the lower parts. Three parallel whitish lines run along the side from the head, two of them under the lateral line; the lowest is about 3 in. long, and the middle one, which commences at the upper part of the eye, is 2½ in. long. Total length, 25·12 in. Length of tail, 5·10 in.

The long lines on the body readily distinguish this genus and species.

Genus 48. OPHISTERNON, *McClelland*.

Unibranchapertura, *Lacép.* Unipertura. *J. Müller.*
Symbranchus, *Cantor; Bleeker.*

Has all the characters of *Monopterus*, except that it possesses the four-fringed branchial arches. The cuticular border of the partitioned gill-openings bounds a transversely oval opening. No air-sac under the skin of the occiput. No swim-bladder.

210. Ophisternon bengalensis, fig. 76.

Ophisternon bengalensis, *McClell.*, *Calc. Journ.* v. 197, 220, t. 11, f. 1, 2.
Symbranchus immaculatus, *Cantor, Cat. Mal. Fish.* (adult); *Journ. As. Soc. Beng.* xviii. p. 1319 (young); *Bleeker, Nat. Tyds.* 11, p. 69 (young).
Tetrabranchus immaculatus, *Bleeker, Nat. Tyds. Ind.* iii. p. 32; *Muræn. et Symb.* p. 57 (young).

Cantor made a small mistake when he referred the Indian *Ophisternon bengalensis* of McClelland to the *Symbranchus immaculatus of* Bloch's description and figure. The *Symbranchus* or *Symbranchus immaculatus* of Bloch is an inhabitant of South America, and has, as Bloch's figure shows, an oval gill-opening on the throat, whereas, in the Indian fish, the two gill-openings, concealed under the border of the arched cuticular collar, have interiorly a longitudinal partition. Bloch evidently confounded the South American and Indian fish. His specimen no longer exists in the Berlin Museum; but a recent specimen from the Brazils is preserved there under the name of *S. immaculatus*. As this is the species which Bloch has figured and described, the name of *immaculatus* must be retained for it, and the names used by McClelland given

to the Indian fish, with some rectification of that naturalist's generic character.

As high as the tide flows in the Ganges, so far does this eel go in great numbers, as well in the dry season as during the rains. It is numerous in the Hooghly, and brought daily in quantities to the fish-bazaars of Calcutta. It remains alive 24 hours, when taken out of the water; but when placed in fresh water it falls speedily to the bottom.

A Malabar specimen measured 23·6 in., of which the tail formed 6·3 in.

Genus 49. SYNBRANCHUS, *Bloch.*

Combines all the characters of *Ophisternon*, with the want of a partition between the gill-openings of the four-fringed gills. The gill opening does not take the angular form that it does in *Monopterus*, *Ophisternon*, and *Amphipnous*. Hinder nostrils situated above the eyes, and capable of being closed by a cutaneous lappet.

211. Synbranchus marmoratus.

Synbranchus marmoratus, *Bloch*, t. 418; *Syst.* 524.

Dorsal commencing before the vent, and the anal behind the vent, but at times not distinctly developed till near the end of the tail. In a very large individual there is the merest trace of an anal fin, and that only near the end of the tail. Colour dark greenish-brown above, yellowish on the under parts; the whole body, the head excepted, being marked by irregular and round spots of various sizes.

Total length, 27·57 in. Length of tail, 2·84 in.

A smaller specimen measured 23·22 in. Tail, 6·37 in.

212. Synbranchus immaculatus.

Synbranchus immaculatus, *Bloch*, *Ausl. Fische*, t. 119, fig. 1 (*ex cute hab. Tranquebariâ*); *Shaw*, *Gen. Zool.* (*a copy*), iv. 36.

Resembles, in all respects, *marmoratus*; but the fins are both on the dorsal and ventral sides of the tail distinctly formed from the anus to the point of the tail. I am acquainted with only a shrivelled specimen in spirits, which has an uniform yellowish-brown colour.

Length, 13·59 in. Length of tail, 3·75 in.

Cayenne.

Genus 50. MONOPTERUS, *Lacépède.*

Only three branchiæ. No lung-like sacs under the skin of the occiput. No nasal bone. Palatine bones meeting in an angle in

front, set with pluriserial teeth anteriorly, diminishing to two and to one row towards the corner of the mouth. Vomer acutely angular, armed with three rows of stronger teeth, diminishing to one row posteriorly. As in *Amphipnous* and *Ophisternon*, the gill-openings form an angle; and the branchiæ are separated by a partition within the orifice in the skin.

213. Monopterus javanicus.

Monopterus javanicus, *Lacép.*: *Cantor*, *Mal. Fish.* p. 339; *Shaw*, iv. 39; *Cuv.*, *Règn. An.* ii. 354; *Swains.* ii. 336; *Bleeker*, *Muræn.*

Monopterus lævis, *Richardson*, *Sulph.* 116, cinereus, 117, pl. 52, f. 1–6.

Ophicardia phayriana, *McClell. Calc. Journ.* v. 191–218, pl. 12, f. 1.

Ophicardia et Synbranchus xanthognathus, *Richardson*, *Sulph.* pl. 52, f. 7.

Synbranchus grammicus, *Cantor*, *An. et Mag. Nat. Hist.* ix. 30.

Synbranchus marmoratus, *Temm. & Schl.*

Monopterus marmoratus, *Rich.*, *Report*, 1845, 315.

This species, which is common in the seas of Japan, China, Java, Borneo, and Bengal, exhibits many varieties. Some are of one uniform colour, others are spotted. It also varies in the length of the head, which is sometimes one-twelfth of the whole length of the fish, sometimes one-fifteenth. Generally the head is proportionally shorter in the young, and the tail is longer and more tapering in the adult. A full-grown specimen from Borneo measures 34 in. Most of the specimens in the British Museum show two furrows on the side formed by folds of skin, the upper one being the most distinct. In a very dark coloured one there are short longitudinal streaks as in the specimen figured by Sir John Richardson. In his larger figure, copied from Reeves' Chinese drawings, there are traces of the white lines and the furrow as a black line. In a pretty large specimen a lateral line, like that of *cuchia*, is visible; but not the white lines that run parallel to it in that species. Two specimens from Chusan, belonging to the East India Company, are more or less spotted. A Chinese specimen wants the rows of distinct black spots; and others from the same seas are wholly of one colour.

APODALS

WITH ARTICULATED FIN-RAYS.

Family GYMNOTIDÆ.

Form eel-like, with a round back and no dorsal fin; a greatly-developed anal fin, which either extends to the point of the tail or leaves the extremity of that member free. Teeth present or wanting on the premaxillaries, the mandible and palatines. None on the vomer. The scapular ring attached to the head. From the fifth vertebra onwards, the belly is enclosed by distinct ribs, which in many species are perceptible through the skin. They have cæcal stomachs, and also pancreatic cæca. Their ovaria are sac-shaped, and the eggs are discharged in a manner widely different from that of the eels. The anus, with a genital papilla behind it, is situated on the pectoral girdle, or still further forwards between the limbs of the mandible. The anterior small swim-bladder placed under the second, third, or fourth cervical vertebra, is of a pear-like form, or heart-shaped, and is double. The outer one is thick, white, and easily torn; the inner one is transparent, full of a gelatinous fluid, and lies loose within the outer one. This anterior bladder is connected with the ossicles of the acoustic organ. It is attached to the single or simple second bladder by a slender cord, which is divided and suspended along with the stomach by an associated ligament. I consider that the anterior double-bladder belongs to the acoustic apparatus, and corresponds with the membranous labyrinth of more highly-organized mollusks.*

The family of *Gymnotida* were placed with the *Apodes* merely on account of the negative character of the want of ventral fins; but, nevertheless, though they do not belong to that group, yet they may stand either before or after them. Fishes which have perfect ventral ribs, branching or jointed fin-rays, a twofold swim-bladder, the anus situated very far forward, even so far as to be under the chin, cannot be placed among Apodals, destitute of ventral ribs, with only simple fin-rays, no twofold swim-bladder, and the anus either in the middle of the length, or far backwards towards the tail. The *Gymnotida* in fact form a proper family, and as such represent the sub-order of Apodals.

As in all classes of animals, so in fishes, we observe certain types of form. One of these types is the elongated, vermicular shape, which is exhibited in the lowest stage of structural development by the *Cyclostomes*. These have been considered as representing the fœtal stage of the Selachians; and in like manner must the Apodals,

* See "*J. Reinhardt von die Schwimblase der Gymnotini, Wiegman's Archiv. fur* 1854," p. 159.

in their order, and the *Gymnotida* and *Leptocephalida* in their under orders, be considered as families of the lowest organisation.

The *Gymnotida* form an interesting family in the order (*Physostomi*), of which the *Salmonida* form the highest family, and the dorsal thong (*peitche*) of the genus *Sternarchus* can be compared only with the adipose fin of the Salmonoids.

The first doubt of the *Gymnotida* belonging to the Apodals was raised by Professor Reinhardt in his excellent treatise on the swim-bladder of the *Gymnotini*, in the *Archiven* for 1854 (p. 180), wherein he remarks that they are without doubt connected by certain abdominal families to the order of *Physostomi*, namely, by the *Characini*.

In the present work I have profited by the able treatise on the *Gymnotida* by Johannes Müller and Troschel in the *Flora Ichthyologica*, by Reinhardt's dissertation on the swim-bladder of the *Gymnotini*, by D'Orbigny's voyage (*Poissons*), edited by Professor Valenciennes, and by the voyage of the *Bonité*. The voyage of Castelneau has made known to me four new species, which as yet I have not met with in nature so as to compare them with his descriptions, and the rivers in which these four species were taken are not mentioned.

I have to return many thanks to Professors Dumeril and Lichtenstein, for the use of the materials existing in the Paris and Berlin Museums, without which I could not have accomplished my task.

This family belongs neither to the beginning nor to the end of the eels, but to the Salmonoid abdominals, of which it constitutes the least-organized family, and is an analogue of the eels. The rays of the pectoral and anal fins, and when the caudal fin is present of it also, are jointed or divided.

It is composed of the following five genera :—

1. Sternarchus (*Schn.*), having a small caudal fin.
2. Rhamphichthys (*M. & Tr.*), having a small, toothless mouth.
3. Sternopygus (*M. & Tr.*), having a small mouth armed by numerous rows of card-like teeth.
4. Carapus (*M. & Tr.*). Scaly fishes, with a row of pointed teeth, and no caudal fin.
5. Gymnotus, *Linn.* Destitute entirely of scales.

Genus 1. STERNARCHUS, *Schneider.*

Diagn. Having a small, normally-formed caudal fin.

Descr. Teeth on the premaxillaries and fore border of the mandible, which form two clusters above, and two rows pointing backwards below. No teeth on the symphysis. Head and body laterally compressed. Head naked. Body scaly. On the middle of the dorsal aspect of the tail there exists a thong, which, in the living fish, reclines in a furrow wherein it is fixed by mucus.* Anus

* This can only be likened to the adipose fin of the *Salmonidæ*, when that is elongated into a filament.

either before or beneath the eye, which has no lid. Nostril small, like a pore. Four rays in the branchiostegal membrane.

1. Sternarchus albifrons.

Sternarchus albifrons, *Bl. et Schn.* 497, t. 94.
Gymnarchus albifrons, *Pall. Spic. Zool.* vii. 36, t. vi. 1 ; *Castelnau Amer. du sud. Zool.* t. 45, f. 1.

A blunt head, and the gape of the mouth extending to beneath the eyes. The finless part of the tail not equal in length to the head. A mesial milk-white stripe runs along the top of the head and back, and two broad dark bars cross the body. According to authors, the numbers of the fin-rays are P. 16 ; A. 147 ; C. 20.

Surinam. British Museum.

See also,

1, Sternarchus Lacépède, *Castelnau Amer. du sud.* t. 45, f. 3.

2, Sternarchus Maximiliani, *Castelnau Amer. du sud.* t. 45, f. 4 : both with small mouths.

2. Sternarchus Brasiliensis.

Sternarchus Brasiliensis, *Reinhardt, Wiegm. Arch.* 1854, p. 182.

Of an uniform dark chocolate-brown colour. Its head is said to be pointed. P. 18 ; A. 177 to 185 ; C. 19 or 20 Rays.

Inhabits the Rio das Velhas.

Since the three species *albifrons*, *Bonapartii*, and *oxyrhinchus*, are essentially separated from each other by the form of the head, it may be that *Brasiliensis* is but a variety of *albifrons*. It is probably on this account that Professor Reinhardt compares the species merely with the figure of *albifrons*.

3. Sternarchus Bonapartii.

Sternarchus Bonapartii, *Castelnau Amer. du sud. Zool.* t. 46, f. 2.

Fig. 1.

Diagn. The most abbreviated species, with a suddenly-shortened tail, whose anal fin reaches closely up to the caudal fin. Gape of the mouth extending distinctly beyond the eyes. Anus situated in the front of the cutaneous part of the expansive, boat-shaped mandible. Dorsal thong black above, flesh-coloured on the under surface, with black points on its sides,* and reaching to within an inch of the caudal fin. Pectoral equal in length to the orifice of the mouth. Anal fin commencing before the gill-opening, and extending backwards to the caudal fin. Lateral line protected by keeled scales, with notched points. The other scales are pretty smooth and moderately large.

Head bluish-black, with lighter, almost white, upper lip and mandible. Back dark brown, dotted with dark spots near the anal fin. P. 16; A. 165; C. 14 Rays.

The Paris Museum possesses a specimen obtained from Count Castelneau.

4. Sternarchus oxyrhinchus, fig. 2.

Sternarchus oxyrhinchus, *Johan. Müll. & Trosch. Flora Ichth.* iii. 16, t. 11, f. 1, 2 (excellent).

Fig. 2.

Diagn. The snout forms a long, slender tube, arched below, with a small mouth at its extremity.

Descr. This is the longest and most compressed species. In the upper jaw there are two clusters of teeth, which are prolonged each into two rows. The eyes are situated between the second and last third parts of the length of the head. Their distance from one another equals two diameters of the orbit. Behind the anal fin the tail is sharply keeled. Lateral line keeled by the arrangement of large scales that accompany it. On the back and over the anal fin the scales are small. Anus situated beneath the eyes. Between

* Cuvier was the first to make the erroneous assertion that this dorsal thong is a detached cutaneous muscle of the tail. More lately Professor Reinhardt supports this opinion in Wiegman's Journal for 1854, p. 183, and remarks that the thong is never observed to be free in the living fish, and that it becomes loose in alcohol, through handling. Since no muscle can become dotted with black on its fleshy side, we may conclude that the thong, though held fast in its furrow by the slimy mucus of the body, becomes free by means of the action of the alcohol on that mucus.

the anal fin and the small caudal fin there is a free space equal to the length of the head. P. 12; A. 215 rays.

This species inhabits Lower Essequibo in British Guiana. Specimens have been sent to the Berlin and Paris Museums by the Brothers Schomburgk.

Genus 2. RHAMPHICHTHYS, *Müll. & Trosch.*

Diagn. A small mouth, wholly destitute of teeth.

Descr. Snout more or less tubularly prolonged, with small, pore-like nostrils, without tubes. Head and body laterally compressed, and covered, with the exception of the head, by small scales. A part of the tail remains free beyond the long anal fin.

One perceives sometimes at the point of a damaged tail a projecting cuticular process, destitute of vertebræ, which resembles the reproduced tail of a lizard. Judging from the narrowness of their toothless mouth, these fish must subsist on small insects, and be themselves destroyed or injured by predacious fishes, whence it happens that the point of their tail is often defective.

I divide this numerous genus into two sections :—

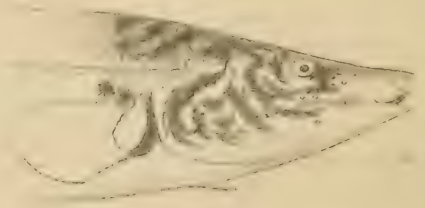
a. *Species having shorter snouts, with the anal papilla much developed, the anus situated on the posterior third part of the head, and the anal fin commencing under the point of the pectoral.*

Of this section three species only are known to me.

5. Rhamphichthys Artedi, fig. 3.

Seba, iii. t. 32, No. 2.

Fig. 3.



Diagn. The free part of the tail forms between the fifth and the sixth part of the total length, and the thickness of the body scarcely exceeds half its height.

Descr. It is a shorter and more compactly made species than the following one, has a somewhat longer head, the eyes situated higher up, and the muciferous pores more conspicuous on the snout, round the eyes, and on the cheeks. Lateral line whitish, and formed of a chain of short, tubular mucoducts directed downwards and obliquely

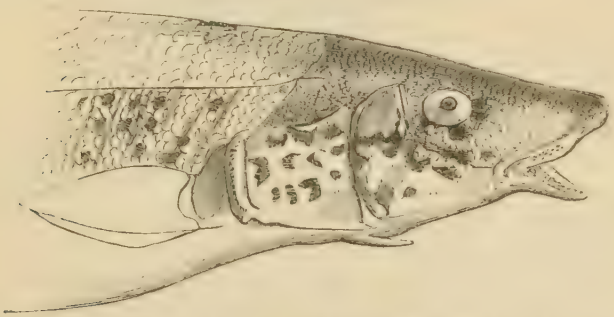
backwards. Colour yellowish-brown, with marbled markings extending over the entire back and sides. Fins yellowish-brown, without markings.

Seba's description and figure are good, and by them the species, which has been overlooked by all other authors, may be readily known. His specimen was 17 in. long. The Parisian one is not quite 11 in. in length. It was procured by Leschenault in the Mona, a river of French Guiana. P. 19 or 20; A. 220 or 223 rays.

Total length	11·62	in.
Diameter of the eye	0·08	,,
Distance between the tip of the snout and the eye	0·47	,,
,, to the gill-opening	1·30	,,
From thence to the anus	0·67	,,
,, to the beginning of the anal fin	1·97	,,
Height of the body	0·87	,,
Transverse diameter of ditto	0·51	,,
Length of the pectoral fin	0·51	,,
,, free part of tail	2·01	,,

6. Rhamphichthys Mulleri, fig. 4.

Fig. 4.



Diagn. The free part of the tail forms the third or fourth part of the total length, and the transverse diameter of the body scarcely exceeds one-third of its height.

Descr. It is decidedly a more slender species than the preceding one, has a somewhat shorter head, and more lateral eyes. The muciferous pores of the head are less conspicuous, but the skin of the top of the head and round the eyes is granular. Colour pale yellowish-brown, with numerous spots on the sides of the head and under the lateral line. Dorsal aspect of the head and the back of an uniform black; the fins also are black, with brown rays. P. 20; A. 220 rays.

I am acquainted with a larger and a smaller specimen, both from Cayenne. The dimensions of the larger one are—

Total length	20·57	in.
Diameter of the eye	0·08	,,

From the point of the snout to the eye	0·71	in.
,, ,, to the gill-opening	1·73	,,
,, ,, to the anus	1·22	,,
,, ,, to the anal fin	2·76	,,
Height of the body	1·45	,,
Transverse diameter of ditto	0·51	,,
Length of the pectoral fin	0·75	,,
,, tail beyond the anal fin	6·46	,,

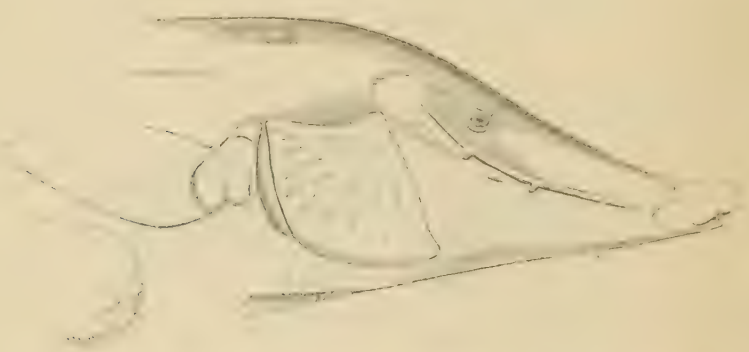
Paris Museum.

b. *Species having the anus under or before the eyes and the beginning of the anal fin before the gill-openings.*

7. Rhamphichthys lineatus, fig. 5.

Rhamphichthys lineatus. *Castelnau Amer. du sud. Zool.*, pl. 47, fig. 1.

Fig. 5.



Diagn. Anus situated in the anterior third part of the head.

Descr. Length of the snout up to the eyes more than half the length of the head up to the gill-openings. Papilla before the anus compressed and concealed. Pectoral equal in length to the space between the posterior nostril and the eye. Body much compressed, with a transverse diameter equal to one-fourth of its height. Head without markings, blackish above, smoky white laterally. Fins yellowish-brown, without bands. *Four dark longitudinal stripes on the sides.* The tail of the solitary Parisian specimen is, as shown by Castelnau's figure 2, suddenly terminated, as if a rapacious fish had bitten off its extremity.

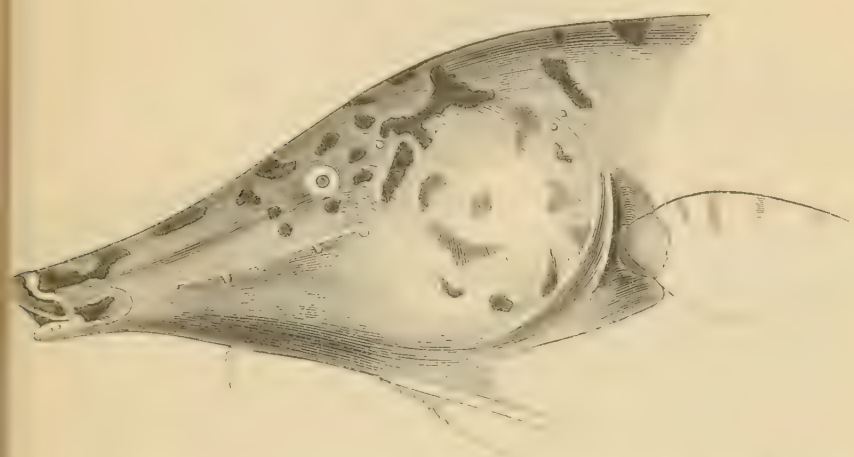
Distance from point of the snout to the gill-opening	2·25	in.
,, ,, ,, to the eye	1·26	,,
,, ,, ,, to the anus	0·71	,,
,, ,, ,, to the anal fin	1·81	,,
Length of the pectoral fin	0·95	,,

Height of the body	1·58	in.
Transverse diameter of ditto	0·39	,,
?Total length supposed to have been	21·26	,,

8. Rhamphichthys pantherinus, fig. 6.

Rhamphichthys pantherinus, *Castelnau Amer. du sud. Zool.*, pl. 16. fig. 3.

Fig. 6.



Diagn. Forehead elevated; snout moderately long; anus in the fore third part of the variously-spotted head.

Descr. Snout forming somewhat above half the length of the head, measured up to the gill-opening. Forehead rising; anus before the eyes, accompanied by a concealed compressed genital papilla, which is notched on its under border. Pectoral fin not half as long as the snout. Head for the most part spotted with black on a greyish-red ground colour. Back broad, with three rows of black spots, and surrounding white dots. Under the streaked lateral line the sides are marbled, and over the anal fin finely dotted. Round the pectoral fin, and near the anus, there is a blue tint; and a stripe of the same hue runs along the front part of the anal fin. Pectoral fin feebly banded. Anal fin almost of one colour, with merely traces of lines and points. It has 405 rays.

Total length	29·54	in.
Length of the tail beyond the anal fin*	3·15	,,
,, of head to edge of gill-plate	2·88	,,
,, from point of the snout to the eye	1·55	,,
,, ,, ,, to the anus	1·06	,,

* The tail seems to have sustained some injury at its end, being unusually short and flat. Its extremity for the length of 0·12 in. is merely skin, and appears to be a reproduction.

Length from point of the snout to the anal fin . .	1·85	in.
,, of the pectoral fin	0·95	,,
Height of the body	2·44	,,
Transverse diameter of ditto	0·83	,,

9. Rhamphichthys marmoratus, fig. 7.

Rhamphichthys marmoratus, *Castelnau Amer. du sud. Zool.*, t. 46, f. 2.

Fig. 7.

Diagn. Anus before the eyes. Snout longer than that of *pantherinus*, and rising less steeply.

Descr. I have seen only a very defective skin of this species, which Count Castelnau brought from South America. It comes nearest to *pantherinus*, from which, however, it is distinguished by a longer snout, and the anus situated more posteriorly. All the scales, moreover, seem to be coarser.

Length of head up to the edge of the gill-plate . .	3·07	in.
,, ,, to the eye	1·62	,,
,, ,, to the anus	1·38	,,
,, ,, to the anal fin	2·13	,,
,, of the pectoral fin	0·95	,,

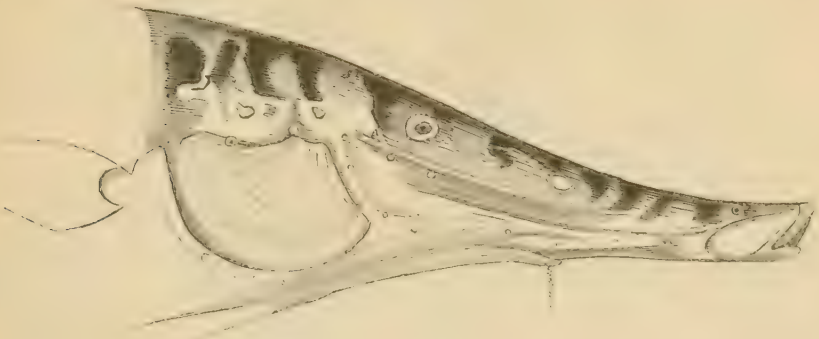
10. Rhamphichthys Reinhardti, fig. 8.

Diagn. Anus situated behind the middle of the elongated snout, accompanied by a distinctly visible genital papilla.

Descr. The length of the rising snout a little exceeds half the entire length of the head. Anus, with its visible papilla, situate on the hinder half of the snout. Transverse diameter of the body contained three times and a half in the height of the same. Head ornamented by blackish spots and yellowish markings. No mark-

ings on the face or gill-plates, except a few light porous specks. Top of the back spotted with black, with light dots. A dark stripe

Fig. 8.



along the lateral line. A grey colour prevails on the side of the belly and above the anal fin; and between it and the lateral line there runs a broader yellow stripe, which disappears towards the tail. Pectoral fin unspotted. Anal fin yellowish-brown at the base, with irregular stripes, and towards its end dark brown with lighter dots.

This species came to the Paris Museum from the collection of Ajuda. It approaches nearest to *Rh. Blochii*, *Schneideri*, and *Schomburgki*, from all which it is readily distinguished by the position of the anus. From *pantherinus* and *marmoratus* it differs in the greater length of its snout. P. 19; A. 394 rays.

Total length	28·75	in.
Length of tail beyond the anal fin*	4·73	,,
From the point of the snout to the edge of the gill-plate	2·99	,,
,, ,, ,, to the eyes	1·81	,,
,, ,, ,, to the anus	1·18	,,
,, ,, ,, to the anal fin	2·29	,,
Height of the body	1·89	,,
Transverse diameter of the body	0·55	,,
Length of the pectoral	0·83	,,

Habitat not noted.

11. Rhamphichthys Blochii, fig. 9.

Rhamphichthys rostratus, *Mull. & Trosch.*

* In this specimen also the tail has been damaged, but there projects, for 0·79 in., a cutaneous flap, which runs into a filament beneath. I consider these cutaneous appendages to be reproductions, an effort of nature which has not been previously noticed among fishes.

Gymnotus rostratus, *Bl. & Schn.* 522, t. 106; *Seba*, iii. t. 32, No. 5.
Carapus rostratus, *Cuv.* ii. p. 357.

Fig. 9.

Diagn. Anus situated somewhat before the eyes, and accompanied by a genital papilla that measures 0·079 in. in length. Snout descending from the eye, and composing about five-eighths of the length of the head. Head and body spotted as in *Schneideri*. Along the middle of the height, above the anal fin, there runs an interrupted line of oblique bars. The fins are marked in a similar manner to those of *Schneideri*.

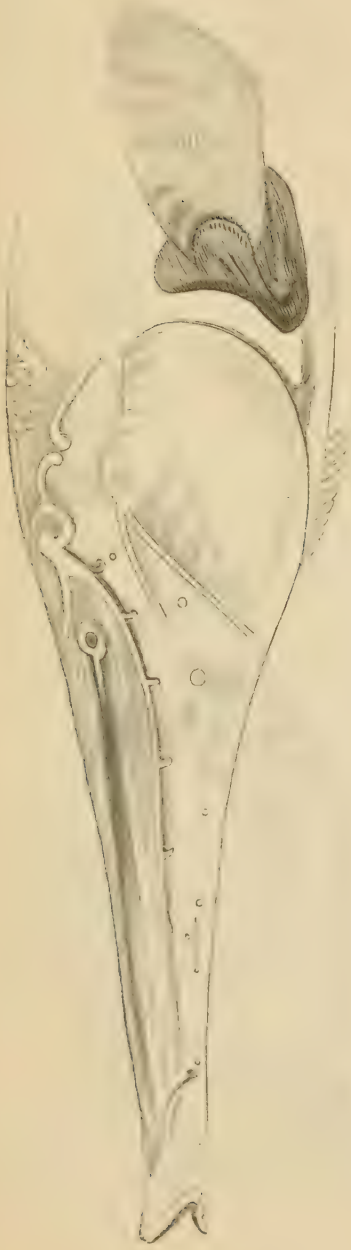
Total length	24·79	in.
Length of finless portion of the tail	5·00	,,
From the snout to the edge of the gill-plate	3·19	,,
,, ,, eye	1·93	,,
,, ,, anus	1·73	,,
,, ,, anal fin	2·76	,,
Height of the body	1·77	,,
Thickness of ditto	0·59	,,

I know of no other example of this species than Bloch's original one, described above. It is now in the Berlin Museum, and is figured in Bloch and Schneider's *Systema*, pl. 106. The upper point of the snout is wanting, which explains the cause of the absence of half the teeth in Schneider's figure. That the head is represented as being scaly, is a liberty taken either by the designer or engraver. The specimen is now wholly faded, and shows the merest traces of its original markings. According to the authors of the *Hora Ichthyologica*, this individual has 365 rays in the anal fin; Bloch and Schneider give the number as 292, and Seba as 296. All these enumerations are erroneous, and Bloch and Schneider do not seem to have taken the trouble of reckoning them, but merely to have deducted four from the number mentioned by Seba.

This species is named anew, since the designation of *rostratus* is not peculiarly descriptive of it. I have not been able to ascertain the place from whence the specimen came.

12. Rhamphichthys Schomburgki, fig. 10.

Fig. 10.



? Rhamphichthys rostratus, *Müll. & Trosch.*

Diagn. Forehead almost in an even line with the greatly-elongated snout. Anus situated before the eyes. Pectoral fins not half as long as the snout. Thickness of the body equal to a fourth part of its height. Head marked with yellow on a brownish ground-colour.

Descr. Colour of the body blackish, with greyish-white scales. A broad black stripe runs along the lateral line. Anal fin blackish towards the points of the rays, and showing a lighter longitudinal line along their roots. It contains 430 rays.

Total length . .	37·66	in.
Length of the portion of the tail beyond the anal fin . .	8·67	,,
Length from tip of the snout to the edge of the gill-plate .	4·57	,,
Length from tip of the snout to the eye .	2·80	,,
Length from tip of the snout to the anus .	2·48	,,
Length from tip of the snout to the anal fin . . .	3·31	,,
Length of the pectoral fin . . .	1·06	,,

This species approaches nearest to *rostratus*, but yet is distinctly separated from it by the conspicuously greater length of the snout.

the more anterior position of the anus, and the different markings. The accounts which have been given of the great variations in the numbers of the anal rays, arise from confusion of this species with *rostratus*.

The large specimen in the Paris collection has near the anus an equally wide opening for the exit of the eggs, and is therefore a female. Specimens exist in the Paris and Berlin collections, presented by the Brothers Schomburgk. I possess an example from Sir Robert Schomburgk himself, who has done so much for the illustration of the natural history of British Guiana. It inhabits the rivers of Demerara, lurking among the roots of the *Caladium arborescens*, and is said to attain a length of from four to six feet.

Fig. 11.

13. Rhamphichthys Schneideri, fig. 11.

Diagn. Anus situated vertically under the eyes, with a papilla no bigger than the head of a fine pin.

Descr. A very long snout, equalling two-thirds of the length of the head, and rising obliquely towards the eyes. Round spots and irregular black bars on the head and body. Also black, irregular lines, figures, and spots on the pectoral and anal fins; and on the minutely-scaly part of the anal fin dark, cloudlike spots scattered over a lighter ground-colour.

Total length .	. 27·57	in.
Length of tail beyond the anal fin, 5·99 to	6·18	,,
From point of snout to edge of gill-plate	3·58	,,
From point of snout to eye or to anus .	2·36	,,
From point of snout to the anal fin .	2·91	,,
Height of the body .	2·05	,,
Thickness of the body	0·67	,,
Length of the pectoral fin . 0·91 to	1·06	,,

Cayenne. The Paris Museum received two specimens from Messieurs Mélinon.

P. 19; A. 416–425 rays.

Genus 3. STERNOPYGUS, *Müll. & Trosch.*

Diagn. Card-like teeth in many rows.

Descr. Head and body compressed, head blunt, with small jaws. Sometimes there are traces of card-like palatine teeth. The tapering tail becomes very slender, and is destitute of a caudal fin. The largest scales lie along the lateral line. In its entire habit this genus resembles *Fierasfer*.

14. Sternopygus macrourus.

Sternopygus macrourus, *Müll. & Trosch. loc. cit.* p. 14; *Bloch*, 157. 2; *Bl. & Schn.* 522.
Carapus macrourus, *Cuv. Règn. An.* ii. p. 357.
Carapus arenatus, *Eyd. et Soul. Bonite*, i. p. 24, pl. 8, f. 1.
Carapus sanguinolentus, *Castelneau*, pl. 46, f. 1.
Sternopygus Marcgravi, *Reinhardt, l. c.* 180.

Diagn. Eyes provided with lids.

Descr. Easily known by its diagnosis, and by its carp-like head and high, thick nape, which is depressed posteriorly. The diameter of the eye varies, so that its employment as a measure of other distances must lead to error. The normal colour is yellowish-brown, with numerous dark points. On the nape, above the gill-plate, there are frequently large round spots with or without white dots.

In a male specimen, labelled *arenatus*, there is a broader or narrower longitudinal yellow stripe on the posterior half of the tail, under the lateral line, which, in the males, is scarcely the twelfth part of an inch broad, and in parts wholly disappears.

A small individual in the Paris collection, which was presented by Sir Robert Schomburgk, is blackish, with cross-bars and longitudinal stripes near the brim of the back. Bloch figures his specimen with round spots scattered over the whole body. I have seen many specimens, but not one like his.

The examples distinguished by the name of *arenatus* were collected in the Guayaquil, a river of Equador. Schomburgk's were probably fished in the Essequibo of British Guiana; and those which Reinhardt has described came from the Rio das Velhas, one of the tributaries of the Brazilian San Francisco. It may therefore be considered as probable that the species is a general inhabitant of the rivers of South America. P. 16; A. 230-274, and 310 rays according to Johannes Müller. It attains a length of two feet or more.

15. Sternopygus virescens.

Sternarchus virescens, *Valenc. in D'Orbig. Voy.* pl. 132.
Sternopygus tumifrons, *Müll. & Trosch. l. c.* 14.
Sternopygus microstomus, *Reinhardt, l. c.* 181.

Diagn. The small mouth, when fully open, has a diameter about equal to that of the eye. Anus beneath the head, situated about the middle of its length.

Descr. Teeth scarcely perceptible, occupying two small surfaces on both jaws. Front nostril in a longitudinal oblong of the bulging tube. Hinder one a pretty distinct orifice, situated before the eye. Mucus pores on the head and nape. Two dark stripes run between the lateral line and the anal fin, and one that fades away traverses the anal fin itself. A specimen in the Paris Museum is almost black.

Total length	7·80	in.
Diameter of the eye	0·16	,,
From the point of the snout to the eye	0·24	,,
Distance between the eyes	0·24	,,
Length of the pectoral fin	0·67	,,
From the point of the snout to the gill-opening	0·95	,,
,, ,, to the anus	0·51	,,
Greatest height of the body	1·26	,,

In the Berlin specimen there projects from the abbreviated extremity of the tail a golden brown thread, which measures about 1·18 in., and seems to be the most distal filamentous caudal vertebræ which have been stripped by accident of their integuments. The specimen described by Professor Valenciennes has, according to the inaccurate sketch of D'Orbigny, a length of snout of 1·97 in. The hinder border of the gill-plate still exists, and is absent in one side only, which has accidentally been deprived of half the spine. How the authors cited have been led to confound this species with *St. Troscheli* is to me unknown.

Brazils. Lagoa Santa (*Reinhardt*).

16. Sternopygus lineatus.

Sternopygus lineatus, *Müll. & Trosch. l. c.* 14.

Diagn. Mouth small; anus near the gill-opening.

Descr. Resembles the preceding species, but has a shorter snout, a somewhat larger mouth, a more compressed body, and a conspicuously longer tail. It has also a band of card-like teeth, extending to the entire breadth of the præmaxillaries. There are two longitudinal stripes above the anal fin like those of *virescens*, but more distinct. The Berlin specimen, $4\frac{3}{4}$ in. long, is not very young.

Total length	10·91	in.
Diameter of the eye	0·16	,,
From the point of the snout to the eye	0·20	,,
Breadth and height of the mouth	0·20	,,
From the point of the snout to the edge of the gill-plate	0·83	,,
From the point of the snout to the occiput	0·63	,,

From the point of the mandible to the anus . .	0·83 in.
Height of the body	0·87 ,,
Thickness of ditto	0·24 ,,

Lake Amucu, in British Guiana. A specimen was presented to the Berlin Museum by Sir Robert Schomburgk. The origin of the specimen in the Paris Museum is not noted.

17. Sternopygus Troschelii.

Sternopygus virescens, *Müll. & Trosch. l. c.* 14.

Diagn. This is the longest and most slender species, with the largest mouth, and a mandible exceeding the upper jaw in length.

Descr. The length of the snout measured from the pupil of the eye equals the height of the expanded mouth. Anus somewhat posterior to the gill-opening. Tail running out in a hair-like point to thrice the length of the body, and the head, measured to the nape, is equal to one-nineteenth of the total length.

British Guiana. A specimen exists in the Berlin Museum, obtained from Sir Robert Schomburgk. The origin of the Parisian example is not noted, but it came, probably, from the same quarter.

Genus 4. CARAPUS, *Müll. & Trosch.*

Carapus partim, *Cuvier.*

Diagn. Flatly compressed laterally. A row of pointed teeth on the snout. Body scaly.

Descr. Front nostril situated in a notch near the corner of the mouth in a short tube; hinder orifice appearing distinctly before the eye. Eyes showing beneath the skin. Branchiostegals five, flat and broad. Anal fin reaching nearly to the end of the tail. Scales along the back and on the lateral line equally large. Under lip longer than the upper one.

18. Carapus fasciatus.

Carapus fasciatus, *Müll. & Trosch.* p. 13.
Gymnotus fasciatus, *Pall. Spicel. Zool.* vii. p. 37.
Gymnotus brachyurus, *Bl.* 157, 1.
Gymnotus carapo, *Bl. & Schn.* 521.
Carapus brachyurus et fasciatus, *Cuv. Règ. An.* ii. 357.
Carapus inæquilabiatus, *Valenc. D'Orbign. Voy.* pl. 14; *Seba*, iii. t. 32, No. 1.

Diagn. Having about twenty-one oblique blackish cross bars.

Descr. A more abbreviated roundish species than the following one. The cross bars near the back are narrower, and often break up into round spots, or split into forks above the anal fin. The

eighteen yellowish-brown bars either break off on the ground-colour of the minutely scaly parts above the anal fin, or are continued in rows of spots only. In very old individuals the blackish bars become mere rows of spots, as the authors of the *Flora Ichthyologica* have already remarked. In the Berlin Museum there is a specimen which has lost nearly all its markings. The largest specimen measures 37·46 in. in total length. It is on this that Professor Valenciennes has founded his *inæquilabiatus*.

From the snout to the gill-opening	3·94 in.
,, ,, eye	1·22 ,,
,, ,, anus	3·74 ,,
,, ,, anal fin	6·54 ,,
Length of the pectoral fin	1·06 ,,
,, projecting under lip	0·47 ,,
Height of the body	3·35 ,,

Cayenne. Common in collections.

19. Carapus albus.

Gymnotus albus, *Pallas, Spicel. Zool.* viii. 36; *Gmelin*, 1137, No. 7; *Bl. & Schn.* 523.

Gymnotus cærulescens, *Seba*, 32, f. 2.

Diagn. Snout elongated, tapering gradually to a point. Upper teeth from 30 to 40 in number; under ones from 50 to 60; all pointed.

Descr. A more elongated compressed form, and furnished with a larger number of teeth than the preceding one, which possesses only from 26 to 30 upper ones, and 36 or 38 under ones.

The Parisian specimens have almost black heads, crowded with darker dots: and their blackish bodies, more especially the tail part, show merely traces of cross bars. They were obtained from the Brothers Schomburgk. A specimen from Cayenne exhibits black spots on the sides of the head. Of these specks, only one, situated on the gill-plate, is represented in Seba's figure. This figure errs, moreover, in the eyes being placed too far back.

Total length	10·63 in.
Length of the head to the nape	0·71 ,,
,, ,, gill-opening	0·91 ,,
From the tip of the mandible to the anus	0 87 ,,
Diameter of the eye	0·08 ,,
From the tip of the upper lip to the eye	0·24 ,,
Distance between the eyes	0·35 ,,
From the anus to the anal fin	1·00 ,,
Length of the pectoral fin	0·35 ,,

See Carapus Sanguinolentus, *Castelnau Amer. du sud. Zool.* t. 46, f. 1.

Genus 5. GYMNOTUS, *Linn.*

Diagn. Skin wholly soft, and entirely destitute of scales.

Descr. One species only is known, which resembles the preceding genus *Carapus* in the general structure of the head, the position of the nostrils, and in the dentition. And as in that, the anal fin leaves but a small portion of the point of the tail free, so in this, the anal extends to the tip of the tail. Head oval, flatly depressed, with the opening of the mouth not extending quite so far back as to beneath the eyes, and with broad lips equal to one another in length. Front nostril, a small tube situated in a bell-shaped hollow, sunk above the extremity of the lateral lip; hinder one placed at the distance of a diameter of the eye, behind and above the front one. Longitudinal and cross rows of pores, lodged in cup-shaped depressions of the occiput; also a row on the mandible. Lateral line formed of a row of pores placed widely apart. Teeth pointed, numbering about 50 in the upper jaw, and 60 on the mandible. There is, moreover, a second row of six teeth behind the middle of the upper ones; and along the symphysis of the mandible two short rows, each of two toothlets. Vomer, palate, and tongue, furnished with lateral serratures and orange-yellow cutaneous rolls. Anus situated before the gill-opening, and furnished with a small slender papilla. Pectoral and anal fins clothed in a thickish integument, so that their rays cannot be enumerated.

20. Gymnotus electricus.

Gymnotus electricus, *Linn. Bloch*, 156; *Seba*, iii. 34, 6.

Blackish above, whitish below. Variegated blackish markings on the anal fin, which run into longitudinal and cross lines. One can feel through the skin from 334 to 350 anal rays. The species attains a length of from 6 to 9 feet.

Total length of one specimen	38·60 in.
From tip of snout to gill-opening	3·78 ,,
,, ,, the eye	0·98 ,,
Width of the mouth	1·73 ,,
From tip of the mandible to the anus	2·92 ,,
,, ,, ,, anal fin	7·09 ,,
Length of the pectoral fin	0·75 ,,
Breadth of ditto	0·79 ,,
Height of the gill-opening	0·91 ,,

The electrical apparatus of this fish is so powerful that it can slay both men and horses. It is exercised by the will, and directed at the pleasure of the fish, even to a distance, as it kills fish from afar. Yet this faculty is exhausted by continuous employment,

and is recovered during repose and by nourishing food. The organ by which this wondrous power is manifested, extends along the whole under side of the tail, of which it constitutes nearly the half of its thickness. It is divisible into four longitudinal bundles, two thicker upper ones, and two more slender below, approached to the base of the anal fin. Each bundle consists of a multitude of parallel membranes, and of nearly horizontal disks, approaching very closely to each other. One side of the bundle is pressed against the skin, and the other abuts on the mesial vertical plane of the fish. Lastly, they are connected to one another by an innumerable multitude of small transverse and vertical disks. The small cells, or rather prismatic transverse canals, by which these two kinds of disks are separated, are filled with a gelatinous matter, and the whole apparatus is supplied with a proportionally great number of nerves. (*Cuvier.*)

Two living examples were brought to London in the year 1842, neither of them weighing more than one pound. In the year 1848 one of them had attained the weight of 40, and the other of 50 pounds, so that each of them had nearly doubled its weight in every succeeding year. (*Zoologist*, No. 78, 1848.) The species, its mode of capture, and many particulars of its natural history, are given in *Humboldt's Observations de Zoologie*, p. 497.

G. Equilabiatus, described in page 16 of that work, and figured on table x., requires to be still better described and figured before we can venture to assign to it its proper place in the system. The authors of the *Hora Ichthyologicæ* place it at the end of their genus *Sternopygus*: and Humboldt figures it as destitute of scales, and makes no mention of scales in his description, but says, "*cultratum, nudum, muco obductum;*" hence it cannot be a *Sternopygus*. Of the anal fin, the Baron also says, "*sed antè caudam desinens, radiis quinque.*" What do these five rays import? Probably an error omitted in the previous enumeration. The distinction of this species from *electricus*, by its swim-bladder, is also an error, since both have a small heart-shaped, as well as a long swim-bladder. Humboldt has overlooked the hinder bladder in *equilabiatus*, and the fore one in *electricus*. The last one is known to be closed, and we may, from analogy, conclude the first to be so also.

It would be most interesting to catch this species in the river Magdalena of New Granada, since it does not exist in any European museum. It has a green colour and a silvery-white belly, with small violet points; the upper and lower colours being separated by a longitudinal white stripe. Jaws of equal length.

Family I. LEPTOCEPHALIDÆ, *Bonaparte.*

Helmichthydæ, *Kolliker.*

Small, generally leaf-like, compressed, transparent fish, entirely devoid of scales, whose lateral line is formed by the intersections of the lateral muscles.

Some groups of the family have teeth, others are toothless, some have pectoral fins, and others want these members. The intestinal canal runs along the inferior edge of the belly, and terminates in the anus, either before or behind the middle of the fish. The skeleton is very imperfect and cartilaginous, and the brain shows through it. Most of the family possess a pointed, or blunt, but rarely a forked caudal fin, at the confluence of the dorsal and anal, from which it is to be distinguished by the form or size of its rays.

Ichthyologists have compared these fish correctly with earthworms or tapeworms. They have evidently an inferior organization to the Anguilliform fishes, inasmuch as their vertebral column is cartilaginous only. Though I have to describe a considerable number of new species, yet I believe that very many have escaped my notice. Of the European forms, that is to say, of the Sicilian ones, there remain numbers not in my list, and the genera *Oxystomus*, *Pterurus*, and *Oxyurus* of Rafinesque still need to be re-discovered and properly characterised, or to be recognised as synonymous with some of the described species.

Genus 1. ESUNCULUS, *Kaup.*

Diagn. *Leptocephali*, with small ventral fins and forked caudals.

Descr. Like the *Leptocephali* in their transparency, in their lateral line, formed by angular, interrupted, transverse lines, in the position of the intestinal canal along the ventral border, in the anus placed far back, and in the rows of black points ranged along the gut. The teeth of the upper jaw are short and straight, while those of the mandible are longer and obliquely inclined forwards, as may also be observed in many toothed *Leptocephali*. That which particularly distinguishes this genus are the small, five-rayed, ventral fins, situated in the middle of the fish, the oblique anal and dorsal fins opposed to one another, and the forked caudal, whose rays are jointed. These characters place this form at the head of the *Leptocephalida*, and indicate that family as the lowest of the Abdominal fishes. The name of the family is derived from the miniature likeness of its members to the Pikes (*Esox.*). I first saw this interesting genus in the Paris Museum, where it is kept under the erroneous appellation of *Helmichthys* of Rafinesque; and we may

therefore suppose that it is an inhabitant of the Mediterranean Sea, and, moreover, from the large number of species, that it is not rare.

1. Esunculus Costai, fig. 3.

Named after Signore Costa, who has gained so great a reputation by his investigations of the Mediterranean ichthyology. The great majority of the specimens are of the thickness of the accompanying figure (3), and I infer, therefore, that it is a hump-backed fish. Their length varies from $1\frac{1}{2}$ in. to $2\frac{1}{2}$ inches.

Head small, snout short, and mandible still shorter. The small mouth is cleft to beneath the eyes, which are large, prominent, and have a silvery lustre. The gill-opening, larger than usual, is oblique. On the gill-cover there are a few dark spots, and the general colour is a reddish flesh-tint. P. 8; V. 5; D. 12; A. 3; C. 24 rays. It is very difficult to reckon the rays of the transparent pectorals, as well as of the other fins, with the exception of the caudal, whose longer rays are very distinctly to be seen. The figure, having been executed by the aid of compasses, furnishes the means of making out the dimensions of the various parts.

Genus 2. HYOPRORUS, *Kölliker*.

Diagn. Jaws elongated, straight, with mere traces of teeth. Hinder nostril above the level of the eye, and before it. Mucous pores round the eye and along the jaws. Body high and prominent at the occiput. Tail pointed.

2. Hyoprorus Messinensis, fig. 4.

Hyoprorus messinensis, *Kölliker, Verh. d. Phys. Med. Gesellsch. in Wurzburg*, iv. p. 101; *Trosch. Bericht. Arch. fur* 1853, p. 140.

This interesting species was discovered at Messina, in the winter time, by Professor Gegenbaur. The example, for which I am indebted to Professor Kölliker, and which I am about to describe, has no visible pectoral fins, though it is not impossible that it may have originally shown traces of these members. The rudimentary pectorals sit so loosely in the skin that they readily disappear under rude manipulation, and, therefore, to be able to determine accurately whether a species possesses pectoral fins or not, it is necessary to examine many examples of that species. What Professor Stummeln mentions as representing pectorals, I have been unable to trace in his original specimen, and I am led to believe that the indications in Professor Gegenbaur's figure are merely cuticular projections under the gill-openings on the sides of

the throat. On the head there are a few pigmentary specks, and the slightly-prominent eyes are silvery in their lustre.

Total length	4·06 in.
Height of body at the hinder third of its length .	0·75 ,,
Length from the point of the snout to the gill-opening .	0·51 ,,
,, ,, to the anus . .	1·73 ,,
Thickness of the body	0·06 to 0·08 ,,
,, head	0·16 ,,
Length of the snout to the fore corner of the eye . .	0·24 ,,
,, of the oral orifice	0·28 ,,

Genus 3. TILURUS, *Kölliker*.

Distinguished from *Leptocephalus* by the rayless cuticular dorsal fin, which begins at the occiput, by the muscular transverse fascicular bands not forming, with their upper and under ends, interrupted chevrons, pointing forwards. No anal fin. Anus situated towards the end of the attenuated tail. Head small, and the mandible scarcely longer than the upper jaw. Both jaws furnished with pointed teeth. Gill-openings with distinctly-visible opercula, situated near together under the throat.

3. Tilurus trichiurus, *Kaup*, fig. 5.

Leptocephalus trichiurus, *Cocco*.
Tilurus Gegenbauri, *Köll. Phys. Med. Gesellsc. in Wurzb.* iv. *Band* 100.

A very slim species, of the thickness of paper, which was first described by Cocco. It was also collected by Dr. Gegenbaur in the winter time at Messina. Charles Bonaparte and Troschel refer *trichiurus* with doubt to *Oxystomus hyalinus* of Rafinesque, which must be a perfectly distinct form, whose long outstretched jaws have a likeness to those of a *Belone*. The Prince cannot have seen a *trichiurus*, and Troschel must have been unacquainted with the works of Rafinesque, otherwise they would not have fallen into this error. Of the three specimens collected by Dr. Gegenbaur, one is now in the Paris Museum, and it is from it that our sketch was taken. There are in this some dots above the lateral line, which occasionally run into transverse stripes. Fine points border the body above and below, up to the extremity of the tail. In the upper jaw there are seven small teeth near the corner of the mouth, and four larger ones towards the taper-pointed snout. In the mandible there are eight teeth, all of nearly equal size.

According to Professor Kölliker, the blood of *trichiurus* is colourless. The specimen described by that learned ichthyologist had the following dimensions:—

Total length	12·21 in.
Length from the point of the snout to the anus	10·91 ,,

Length of the head	0·20 in.
,, of the filamentous tail	1·69 ,,
Height of the body	0·51 ,,
,, at the anus	0·08 ,,
Length from point of the snout to the eye	0·12 ,,
,, ,, to the pectorals	0·24 ,,
Thickness of the body	0·04 to 0·08 ,,
,, head	0·06 to 0·07 ,,
Diameter of the black eyes	0·05 ,,

Of *Leptocephalus filamentosus*, of Risso, I have been unable to find either a description or drawing, and it must be a mere manuscript name. It is probably the same with *trichiurus*.

4. Tilurus Rissoi, *Kaup*, fig. 6.

Resembles *trichiurus*, but the tail is less hare-like, and the snout less conical, yet more pointed. Twelve teeth in the upper jaw, nine larger ones in the mandible. I know of only one specimen, which is in the Paris collection, and was found by Bibron at Messina in the month of May. This example is, perhaps, defective in the tail, but it may, with greater probability, be considered to be a species having a less elongated, and not so hare-like a tail.

Genus 4. LEPTOCEPHALUS, *Linnæus*.

Distinguished from *Tilurus* by the tail not being prolonged in so hare-like a form, and by the lateral muscular fasciculi being bent angularly forwards. The genus includes species with and species without teeth, species in which the teeth are imperceptible to the unaided sight, and species whose teeth are proportionably stout, very long, and pointed, and which may be readily seen by the naked eye. Most of the species possess small pectoral fins, but there are some without a trace of these members. It seems, as Costa has already remarked, that all are without a distinctly-visible anal opening, but have merely a most minute aperture, through which the fluid excrement escapes from the extremity of the alimentary canal. It is, therefore, only in fresh specimens, by pressing the gut and looking at the extremity of the intestinal canal or beginning of the anal fin, that one can discover the exact position of the anus through the escape of the fluid. This is often impossible with specimens that have been long immersed in alcohol. I have referred the genus *Helmictys* (better, *Helmichthys*) of Rafinesque to *Leptocephalus*, because, from its roundish form, it would be very difficult to distinguish the two. It has the same structure of the head and shape of body with *Leptocephalus*, differing from it merely in its (*punctatus*) rounder form and more earth-worm-like habit, while *L. Spalanzani* is more compressed. I cannot assent, therefore, to a generic distinction founded merely on a rounder body, and

this so little definite, that *Leptocephalus diaphanus* (*Helmichthys diaphanus*, Costa) is an intermediate form.

5. Leptocephalus Morrisi, *Gmelin.*

Leptocephalus Morrisi, *Bl. & Schn.* t. 108, f. 2 (copied from *Penn. Br. Zool.* t. 25); *Yarrell, Br. Fish.*
Leptocephalus Gussoni, *Cocco.*
Leptocephalus candidissimus, *Costa, Fauna Nap.* t. 20.
Leptocephalus vitreus, *Kölliker, Zeitsch. für Wiss. Zool.* iv. 360.

Diagn. A blunt head; scarcely visible teeth. The lateral line, belly, and anal fin dotted with black points; tail pointed; the greatest height of the body equalling a ninth part of the total length.

Descr. This species, though one of the earliest known to naturalists, I have not as yet seen. It has the greatest likeness to *Spalanzani*, and is only distinguished from it by its higher body. When I compare the above-mentioned figure of *Morrisi* with the *candidissimus* of Costa, I can detect no character by which they may be distinguished from each other.

6. Leptocephalus Spalanzani, *Risso*, fig. 7.

Leptocephalus Spalanzani, *Risso, Hist.* iii. 205.

Diagn. A blunt head; almost imperceptible teeth. Lateral line, edge of the belly, and anal dotted with black. Tail pointed. Height of the body scarcely exceeding one-thirteenth part of the total length.

Descr. The same bottle which contained *Leptocephalus diaphanus* (labelled *Lepidopus pellucidus*, Risso) held also this species (*Spalanzani*) and *punctatus*, all of which had been collected by Savigny, in the year 1823, at Nice, and sent by him to the Paris Museum. What the species truly is that is figured by Risso (*Ichth. de Nice*, t. v. f. 19) under the name of *Lepidopus pellucidus*, I have not ascertained; but I can at least affirm that it bears not the least likeness to our sketch, given above. Neither does the description published by Risso at a later period, in his *Hist.* t. iii. 205, suit *pellucidus* well, but agrees better with our drawing. Risso says, "Its snout is rounded, and the upper jaw is a little longer than the mandible;" but in *pellucidus* both jaws are pointed, and of equal length. Risso himself seems not to have been certain of the identity of his *Spalanzani* with *pellucidus*, or he would not have employed a new specific name. *Lepidopus pellucidus* remains, therefore, a questionable species, which, it is to be hoped, will yet be recovered. *L. Spalanzani* is distinguished unmistakably by its slimness from the most elongated known example of *L. Morrisi*.

Total length	4·57 in.
Length to the anus	1·77 „

The distance between the point of the snout and the anus is comprised twice and five-sevenths in the total length.

7. Leptocephalus punctatus, *Kaup*, fig. 8.

Helmictis punctatus, *Raf.*, *Carat. App.* t. ii. f. 3.
Helmichthys punctatus, *Bonap.*, *Cat. Meth.* 40.

Diagn. A round vermiform body; difficultly visible transverse muscular folds; points along the lateral line; oblique pairs of dots along the edge of the belly; anus before the middle of the body; and a row of indistinct points on the anal fin.

Descr. This species was first represented in the small work of Rafinesque, (*Laratteri*, &c.) The figure is moderately good, and errs only in wanting all the fins, which have been overlooked, as is the case also in the first plate of *L. Morrisi*.

The specimen preserved in the Paris Museum came from Nice, whence it was sent by Savigny, under the name of *Lepidopus pallidus*. It has five mucous pores along the mandible, which, on one side, is morbidly white. In the upper and under jaws there are teeth even with the lips, and so slender and minute, that they are with difficulty to be distinguished exteriorly, and can scarcely be indicated in a drawing.

Total length	4·02 in.
Length to the anus	1·65 ,,

The last measurement is comprised in the total length twice and three-seventh times.

8. Leptocehalus diaphanus, *Kaup*, fig. 9.

Helmichthys diaphanus, *Costa*, *F. Nap.* tav. 31.

Diagn. Anus nearly in the middle of the total length. A row of black points on the dorsal and anal fins only.

Descr. Snout short, and pointed; eyes proportionally large; dorsal fin commencing somewhat before the anus, and tapering gently to the point of the tail, without forming a distinct caudal fin. Costa's figure, as does also mine, exhibits a bulging of the size of a pin's head.

The Paris Museum possesses, probably by the gift of Costa himself, a small specimen about 2·92 in. long. Our figure, given above, measures 1·37 in. in length, whereof the tail forms 2·09 in. Costa's figure is 4·65 in. long, the tail constituting 2·36 in. thereof.

The specimen which my sketch represents was captured at Messina by Professor Kölliker, and wants the pectoral fins.

9. Leptocephalus Köllikeri, *Kaup*, fig. 10.

Diagn. A blunt caudal fin, supported by perceptible rays. Body slender, and of equal wideness throughout.

Descr. Through the kindness of Professor Kölliker, I possess an example of this species, which was also procured by him at Messina. It is essentially separated from *diaphanus* of Costa, by the

anus not being in the middle of the total length, and by the distance from the tip of the snout to the anus being contained twice and seven-tenths in the whole length of the fish. Two rows of dots run along the edge of the belly, more crowded towards the anus and surrounding that orifice. One row of black dots also extends along the roots of the anal rays. This is a slender, nearly linear fish.

Total length	3·31	in.
From the point of the snout to the small gill-opening	0·39	,,
,, ,, anus	1·22	,,
Length of the pectoral fin	0·08	,,
,, caudal fin	0·05	,,
From the point of the snout to the dorsal fin, 0·63 to	0·67	,,

10. Leptocephalus Gegenbauri, *Kaup*, fig. 11.

Diagn. Teeth scarcely perceptible. No rows of dots on the lateral line. Anus situated nearly in the middle of the total length. Caudal fin blunt, with distinct rays.

Descr. This species was also discovered at Messina by Professor Kölliker, who had the goodness to send me a specimen. It nearly resembles *Bibroni*, but is more slender, and the anus is in the middle of the length, which is not the case with *Bibroni*. From *diaphanus* it is distinguished by its higher body, longer snout, and the more developed blunt caudal fin.

Total length	4·25	in.
Distance to the anus	2·21	,,
Height of the body	0·43	,,

11. Leptocephalus Bibroni, *Kaup*, fig. 12.

Diagn. Without visible teeth, and no rows of dots on the lateral line. The distance to the anus goes once and three-quarters in the total length. Caudal fin blunt, with distinct rays.

Descr. For an example of this species, also, my thanks are due to Professor Kölliker, as well as for *Yarellii* and *Gegenbauri*. It is a little more slender than *Gegenbauri*, and its anus is conspicuously farther back.

Total length	4·14	in.
Distance to the anus	2·30	,,
Height of the body	0·51	,,

12. Leptocephalus Yarellii, *Kaup*, fig. 13.

Diagn. Short, visible teeth; blunt caudal fin; and anus in the distal third of the length.

Descr. This species, named after my highly-esteemed friend, Mr. Yarrell, has much likeness to *Bibroni*, but is distinguished from it by the presence of teeth, and the more distal anus. *L.*

Gegenbauri has also a resemblance to this species, but its teeth are scarcely visible, and its anus is in the middle of the body.

Total length of *L. Yarellii*	4·14 in.
Distance from the anus to the point of the caudal .	1·14 ,,

Messina. (Professor Kölliker.)

13. Leptocephalus stenops, *Kaup.*

Diagn. Stout teeth, and large approximating eyes.

Descr. This species may be at once known by the position of the eyes near to each other, their blackness, and their unwonted size. On the jaw, beneath the eye, there are about twenty-one fine teeth, which are difficult to number; three or four bigger ones exist farther forwards, but I have been unable to detect any on the point of the snout. On the mandible there are about seventeen. On the border of the belly there are some ring-shaped, pigmentary spots. The anus is placed moderately far back. Along the anal fin, a row of fine points. Rays may, by the aid of a lens, be distinctly seen in the small caudal fin.

Total length	4·53 in.
Length to the anus	3·31 ,,

An example exists in the Paris Museum, probably, but not certainly, from Messina.

14. Leptocephalus longirostris, *Kaup*, fig. 14.

Diagn. Length of the diameter of the eye contained nearly twice in the length of the snout. Tail pointed.

Descr. This species was also discovered by Bibron at Messina, and is distinguished from its congeners by the length of its snout. The teeth are distinctly visible, and stand on the outer border of the transparent jaws: they are pointed, and inclined forwards. The front ones of the upper jaw are almost horizontal, and the opposing mandibular ones are curved, and somewhat card-like. Eight teeth, of a smaller size than those nearer the point of the snout, stand under the eye. On the mandible there are seventeen, of which the smaller ones are near the corner of the mouth. Body unusually high, and towards the tail flat and tapering. In the solitary specimen contained in the Paris Museum, I saw no points, nor was I able to discover the position of the anus. The large eyes are black, and a dark tint intervenes between them and the point of the snout. Opercula and pectoral fins distinctly visible, but the rays of the pectorals are not distinguishable.

15. Leptocephalus brevirostris, *Kaup*, fig. 15.

Diagn. Fourteen teeth in the upper jaw, and as many on the mandible, the smallest being the upper ones near the corner of the mouth. Neither on the lateral line, nor elsewhere, are rows of dots to be seen.

Descr. Closely resembling *longirostris*, but essentially separated from it by the shortness of the snout; neither is the body as high, nor does the back fall down so flatly from the occiput. The small, slender, somewhat truncated caudal fin is sustained by visible rays. Eyes, like those of *longirostris*, black.

Total length	3·15 in.
Length to anus	2·71 „

Messina (from whence a specimen was sent by Bibron to the Paris Museum).

16. Leptocephalus acuticaudatus, *Kaup*, fig. 16.

Diagn. Pointed caudal and pectoral fins. Ring-like dots on the anterior part of the ventral border.

Descr. Head moderately blunt; no teeth; eyes gold-coloured. The pigmentary rings on the fore part of the ventral rim pass into black points, which probably extend to the tip of the tail. The dorsal fin, destitute of visible rays, begins near the head. Our figure is like those of the other species of the natural size.

Malabar. (A specimen in the Paris Museum. From Dussumier.)

17. Leptocephalus Dussumieri, *Kaup*, fig. 17.

Diagn. A very small head, no teeth, and a pointed tail destitute of a caudal fin. No dots either on the lateral line or along the edge of the belly.

Descr. Three examples exist in the Paris Museum, one of which is dried up to the thinness of paper; and a small one was sent from Malabar by Dussumier. It is a moderately-elongated species, whose transverse muscular furrows are very fine, and not near each other. The pectorals are wanting. In none of the fins could I discover rays.

18. Leptocephalus dentex, *Cantor*.

Leptocephalus dentex, *Cantor, Mal. Fish.* 1315.

Diagn. A short, taper-pointed snout. Five teeth in the upper jaw, with five smaller ones interposed. Five mandibular teeth, with three between the front ones.

Descr. Entire length five inches and a half, in which the length of the head is contained seventeen and a half times. The origin neither of an anal nor dorsal fin could be detected. The specimen was found in the stomach of a *Johnius diacanthus* at Penang, and was partially injured by digestion. This species cannot be confounded with the preceding one, being sufficiently distinguished by the presence of teeth.

19. Leptocephalus tænia, Paris Museum, *Kaup*, fig. 18.

Diagn. A round head. Large, projecting, globular eyes. A short snout, whose length equals the diameter of the eyes. Seven pointed

teeth in the upper jaw, and many smaller ones under the eye and towards the corner of the mouth. Ten or eleven larger ones on the mandible.

Descr. The hinder nostril is situated on the point of a bladder-like swelling. It is a very elongated species, and I can perceive transverse rows of points, but no fins; neither can I discover the orifice of the anus; but in a small specimen it was 0·2 in. from the tip of the tail.

Two specimens from India, and two from the Maldives, exist in the Paris collection, which received them from Dussumier in the year 1830. Also a larger one and two small ones from the island of Waigiou, and one small specimen from the neighbourhood of the Marianne Islands, obtained by Quoy and Gaimard.

Resembles *marginatus* in the interrupted transverse rows of points. Perhaps this species also, in a recent state, possesses anal and dorsal fins, and rows of black dots.

20. Leptocephalus marginatus, *Quoy & Gaimard, Kaup*, fig. 19. ?

Diagn. No teeth. Fine dots in rows on the dorsal and anal fin. Under the lateral line, interrupted short transverse lines, with black points.

Descr. In the Paris collection there is a dried specimen laid out on paper, marked *Leptocephale bordé*, Q. & G., and accompanied by the following note: "A species distinguished, when newly taken, by a black line on the borders of the dorsal and anal fin; and further, by oblique black bars on the body."

In a collection made on the same voyage in the Atlantic Ocean, there are eleven specimens put into one bottle, whereof four are examples of this species, and the remainder belong to *Leptocephalus tænia*. The mandible is somewhat curved upwards. In none of the specimens could I see a trace of pectoral fins, and towards the end of the tail only could I perceive traces of rays. The eyes are silvery coloured. It has an equal breadth throughout, like *tænia*, and I conjecture that the anus is far back, as in that species. Under the name of Kouleny, a small specimen was sent to the Paris Museum from Pondicherry by Leschenault.

21. Leptocephalus lineo-punctatus, *Kaup*, fig. 20.

Diagn. This is also an elongated species, with rows of fine points above the middle line and over the intestinal canal.

Descr. Expanded on the same piece of paper with *Leptocephalus marginatus*, there lay the fish of which we took the sketch presented above. It was labelled — "Probably another species of *Leptocephalus*."

It is altogether a distinct species, in which the dots on the lateral line are so crowded together, that to the naked eye they form an uninterrupted black line, which extends from the head to the end

of the tail. In the example in the Paris Museum, the point of the snout projects, over and beyond the hare-like jaws. In this skin I can neither discover the position of the anus nor the fins. Whether the projection of the snout is normal, or whether it depends on the drying and shrinking of the specimen, must be determined at some future time.

This species has, seemingly, a like origin with *tænia* and *marginatus*.

22. Leptocephalus capensis, *Lalande*.

At the Cape of Good Hope there exists an elongated species, of which a dried skin was presented by the above-named voyager (De Lalande) to the Paris Museum.

It has a taper-pointed head, and on the jaws one can discern very slender, long, and pointed teeth, especially on the mandible. The anus is 0·87 in. from the point of the tail. A row of points exists on the short anal. I am unable to find either pectoral fins or dorsal on this skin; and the lateral line exhibits neither longitudinal nor transverse rows of points. In this dried specimen the colour is hazel-brown; but such was certainly not the original tint, since all the other species are dead white.

Family II. OPHIDINÆ.

Gadoid forms, destitute of ventrals; with elongated, more or less sword-shaped bodies, whose anal and dorsal fins coalesce at the point of the tail, without a break.

Genus 1. MACHÆRIUM, *Richardson*.

Diagn. Anus terminating the proximal third part of the scaly body; mandible destitute of barbels.

Descr. A single row of teeth, running round the jaw. Dorsal fin commencing a little posterior to the pectorals, and the anal fin continued along the distal two-thirds of the length of the fish. Six branchiostegals. Lateral line ceasing under the tenth dorsal ray. No swim-bladder.

1. Machærium subducens, *Richardson*.

Machærium subducens, *Rich., Ereb. & Terr.* 72, pl. 44, f. 1–6.

Rays: P. 10; D. 71; C. 10; A. 60.

This fish attains a length of eleven inches.

Length from the tip of the snout to the gill opening	.	1·62	in
,, ,, anus	. .	3·70	,,

Length from the tip of the snout to the beginning of the dorsal	2·17 in.
Length of the pectoral	0·39 „

Vertical fins equally developed, and of the same height. Pectoral fins wider than long, and moderately short. All the rays branched and articulated. Scales on the cheeks and over the gill-plates. Rest of the head naked; and furnished with mucoducts on the crown of the head, round the eyes and scaly cheeks, and on the borders of the occiput. Slender scaly slips between the rays of the dorsal and anal fins. Black spots on the head, and on the anal, caudal, and dorsal fins.

West and north coasts of Australia. Port Essington.

Named by the aborigines *Ambeetunbeet*.

A specimen exists in the Museum of Haslar Hospital.

Genus 2. OPHIDIUM, *Linnæus*.

Anus terminating the proximal third or half of the body, which is scaly. Two pairs of barbels on the mandible, attached to the point of the lingual bone. A swim-bladder.

Descr. Small, sword-shaped fish, with feebly-developed dorsal and anal fins, which are supported by simple rays. The large oviform and thick swim-bladder is supported by three bones, which are suspended to the first pair of ribs; the middle one being capable of motion by its proper muscle.

2. Ophidium brevibarbe, *Cuvier*, t. 16, fig. 1.

Ophidium brevibarbe, *Cuv. Règn. An.* ii. 359.

Diagn. On the point of the snout, a short decurved spine.

Descr. Strong teeth, scaly occiput and gill-plate, and long, tapering, pointed tail. Dorsal and anal fins bounded by a black marginal line.

Total length, 7·88 in., of which the tail constitutes 4·01 in.

Brazils: perhaps the whole South American coast.

The remaining species are destitute of the rostral spine, and have fewer or no scales on the occiput and gill-covers; they are also shorter.

3. Ophidium brasiliense, Valenciennes, Par. Mus.

Short barbels, that do not reach to the breast. Teeth stouter than those of a *barbatus* of twice the size. The dorsal fin only is bordered with black.

Sent to the Museum by De Lalande.

4. Ophidium Vasalli, *Risso.*

Ophidium Vasalli, *Risso, Hist. Nat.* 212.
Ophidium chrysocephalum, *Raf.* 19, No. 46.

Traces of scales on the occiput and operculum. No black edging to the fins. There are four barbels of equal length.

Paris Museum.

5. Ophidium barbatum, *Linn.*

Ophidium barbatum, *Bl.* 159, f. 1; *Yarr.* 415.
Ophidium physocephalum, *Raf.* No. 45.

The two anterior barbels shorter. Flesh-coloured, with black edging to the dorsal and anal fins. No scales on the gill-plates.

6. Ophidium marginatum, *Dekay.*

Ophidium marginatum, *Dekay, New York Fauna*, pl. iii. 169, p. 315.

Colour gray, with dark longitudinal stripes; beginning of the anal white; its end and that of the dorsal fin edged with black. This fish is named the "Small Cusk," and it has a resemblance to the Gadoid *Brotula.*

Paris Museum.

I am unacquainted with the *Ophidium stigma* of Lay and Bennett, or with the *Oph. Rochei* and *Oph. Broussonetti* of Müller.

Genus 3. GYMNELIS, *Reinhardt.*

Gymnelis, *Reinhardt, Beretning. an den Kong. Vidensk. Selsk. Forh.* 1830 *og* 1833; *Id. Bidr. til den Groenl. Fauna Kjobenhavn*, 1837, p. 49, No. 53; *Richardson, Belcher's Arctic Voy.* ii. p. 367, 1853.
Ophidium, *Linn., Penn., Yarrell.*
Cepolophis, *Kaup*, MSS.

Ophidia destitute of barbels and scales. Six branchiostegals.

Descr. Resembling the true *Ophidia* in the blunt head. Vomerine teeth not projecting forwards, but seated deep in the palate. Anus placed in the proximal half of the fish. Pectoral and vertical fins moderately developed. This genus differs essentially from *Fierasfer* in the anus not being in the pectoral region, but further back, as in *Ophidium*; in the vomerine teeth not projecting forwards, but being more distal and near the line of the jaws; the body also is less slender, and the tail not so acutely sword-shaped.

7. Gymnelis imberbis.

? Ophidium imberbe, *Linn.* No. 2; *Gmelin*, 1147; *Montag. Wern. Mem.* i. 95, pl. 4, f. 2; *Yarrell*, 412.
Cepolophis Montgui, *Kaup.*

Length about three inches; head round and blunt. Dorsal fin commencing at the base of the pectorals. Anus nearly in the middle. Colour purplish brown, and along the root of the pectoral fin there are ten small, bluish-white, regularly-placed spots, which however cannot be seen without the aid of a lens, and are apparently peculiar to the young. Pectoral fins pale and caudal yellowish. P. 11; D. 77; A. 44; C. 18 or 20 (according to Montagu).

8. Gymnelis viridis, *Rheinhardt.*

Ophidium viride, *Fabr. Faun. Grönl.* 148, No. 99; *Gmel.* 1147.
Gymnelis viridis, *Reinh. l. supra cit.* No. 53, p. 49. ? *Richards. Belch. Voy.* ii. 367, pl. xxix. f. 1–3. *Idem*, pl. xx., f. 1–2. *Var. unimaculata*; ? *Kroyer, Voy. de Gaimard. in Scand., varietates plurœ* (?).
Cepholophis viride, *Kaup, MS.*

Diagn. Anus situated towards the end of the proximal third part of the length of the body.

Descr. Head less round, more oval, and its length comprised six or seven times in the total length. Dorsal fin beginning at the tips of the pectorals. Body terminating in a moderately blunt tail, but the caudal fin is less fully developed than that of the preceding species. Colour green, with numerous fine blackish points which cannot be seen by the naked eye.

Total length	5·83 in.
Length to the anus	2·09 ,,
To the beginning of the dorsal fin	1·22 ,,
Length of head to the gill-opening	0·87 ,,

P. 11; D. 87; A. 68; C. 10 = 165 vertical rays. (Richardson gives precisely the same number of rays in the vertical fins, without distinguishing the caudal rays from the others. Reinhardt reckons 168 vertical rays.)

The Paris Museum possesses a specimen received from Professor Reinhardt. On it I have founded the generic character, since I know *G. imberbis* only through Yarrell's description and figure. Pennant (in British Zoology, pl. 29,) gives a figure named on the plate "Beardless Ophidium," but which is copied from Schneider, who terms it *Oph. chinense*. It differs from the drawing of Montagu in the dorsal fin commencing further back, and in the shape of the head. Rafinesque also (pl. 4, f. 4) gives a sketch of an *Oph. punctatum*, which has a more acutely tapering tail than Pennant's figure. Whether these constitute two distinct species, or whether they belong to the same species, must be decided in future, since

neither the drawings nor the descriptions are sufficiently precise to enable us to judge correctly. This is not the case with Montagu's figure. The *Ophidium blacodes* of Forster belongs either to this place or to the *Ophidium*, which Temminck and Schlegel were inclined to refer to *Brotula*. The *Oph. maculatum* of Tschudi belongs to *blacodes*, according to a brief notice of Johannes Müller in the "*Bericht über d. Leist. &c. Archiv.*" 1846, p. 353.

Genus 4. FIERASFER, *Cuvier*.

Oxybeles, *Richardson*.
Echiodon, *Thomson; Yarr.*

Anus in the pectoral region; vomer prominent in the roof of the mouth, and armed with blunt or laterally-compressed teeth. Seven branchiostegals. No scales.

9. Fierasfer acus, *Kaup*.

Fierasfer massiliensis, *Brünnich*, 13, 24.
Gymnotus acus, *Gmelin*, 1140, No. 9.
Notopterus Fontanesii, *Risso, Ichth. de Nice*, 82, t. iv. f. 11.
Fierasfer Fontanesii, *Costa, Fauna Nap.* t. 20 (*bis*).
Ophidium fierasfer, *Risso, Hist.* iii. p. 212.
Ophidium fulvescens, *Raf. Caratteri*, p. 38, No. 282; *Swains. Cycl.* f. 77 and 130 *a*.
Fierasfer imberbis, *Cuv. Règn. An.* ii. 359.

A very slender body posteriorly, tapering away into an acutely-pointed tail. Under the lateral line as far as the intestinal canal reaches there runs a row of fifteen silvery or golden spots, with solitary black dots. Black dots or points run also over the head and sides towards the end of the tail and occasionally form black angular transverse bars on the back. The premaxillaries support near their symphysis two rows of card-like teeth, and near the corner of the mouth there are more rows of blunt vitreous-looking ones. A tuft of pointed teeth stands on the elongated projection of the vomer, the middle row being the tallest: they are a little compressed laterally and more round and curved at their points. On the palatines the teeth are vitreous-looking. The mandibular teeth are in several rows, the outer row being the tallest.

This is a common fish in the Mediterranean, and is esteemed for the tenderness of its flesh. Since the *Ophidium imberbe* of Linnæus, Pennant, and Yarrell is a totally distinct fish, the name of *imberbis* erroneously applied to it by Cuvier cannot stand. The figure in Risso's Ichthyology is recognisable. Risso says that the tongue is somewhat rough, but this is true only of its distal parts; the proper tongue is smooth and pointed and reaches to the projecting part of the vomer; he also states erroneously that the *pre-operculum* is denticulated, but he was deceived by the angular silvery

markings which occasionally occur. The intestines are enclosed in a peritoneal sac having a silvery lustre with small black rings, which in the males are visible through the ventral integuments. P. 18; D. 140; A. 170 rays, according to Risso.

Total length	7·18 in.
To the point of the gill-plate	1·02 „
To the anus	0·87 „
To the dorsal	1·69 „
Length of the pectorals	4·92 „

10. Fierasfer dentatus, *Cuvier.*

Fierasfer dentatus, *Cuv. Règn. An.* ii.

Echiodon Drummondi, *Thomps. Proc. Zool. Soc.* 1837, p. 55; *Id. Zool. Trans.* ii. 207, pl. 38; *Yarr. Br. Fish.* ii. 417, with two figures, or *Id. Suppl.* 41.

Diagn. Four card-like teeth in the upper jaw, also four in the mandible which stand in pairs as canine teeth with an interval between.

Descr. This species varies in the upper jaw and mandible, having sometimes only one lateral snag-tooth, or two below and one above, or four above and two below, as in Yarrell's vignette. When the pairs are perfect in both jaws the interior front ones are so closely approximated that one may without a lens easily overlook their separation, and reckon them only as one. The rest of the teeth are blunt with sprinklings of glassy lustre. In this species the anus is situated somewhat further back under the middles of the pectoral fins, and the dorsal fin commences rather nearer to the head. Colour apparently reddish, the sides dotted and the distal parts of the fins and tail blackish. Iris, gill plates and belly having a silvery lustre. There are no black rings on the silvery peritoneum. The Irish specimen was eleven inches long. I consider it to have strayed thither from the Mediterranean, where it is a common fish. This fish has been set up erroneously as the type of a new genus, which would not have been the case had the preceding species been properly known. Mr. Thompson holds moreover that his fish is distinct from *dentatus*, which is not the case. I saw many examples in the Paris Museum of variations in the numbers of the teeth, such as $\frac{2-2}{1-1}$; $\frac{2-2}{2-2}$; $\frac{1-1}{2-2}$; $\frac{1-1}{1-1}$; arising from one or more of the teeth having been broken off. In this genus all the species exhibit variety in their dentition, and the naturalist who founds genera upon accidents might add many to the number. D. 180; A. 180; C. 12; P. 16 rays, according to Thompson.

11. Fierasfer Homei, *Kaup.*

Oxybeles Homei, *Richardson, Ereb. & Terr.* 73, pl. xliv., fig. 7 to 18. Two full figures.

Oxybeles Brandesi, *Bleeker, N. Tyd. N. Ind.* p. 43, 1850–51.

Diagn. The thick teeth forming the middle row of the vomerines are connected at their bases, and the outer row of mandibulars are taller than the others. Two larger teeth stand on the symphysis of the upper jaw.

This species resembles the common *Fierasfer acus* rather than *dentatus*, but the head is blunter and the distance between the point of the snout and the tip of the gill-cover is comprised six times and a half in the total length, while in *acus* the total length is seven times as long as the same part of the fish.

Head forming a seventh of the total length of the fish, and thicker than any part of the body, snout rounded, body acutely tapering, compressed, tail acute. Anus before the pectoral fin, under the superior angle of the gill-opening. Eye lateral, large, bright, and silvery. Tongue conical, smooth. Teeth setaceous in even villiform bands on the premaxillaries, mandible, and edges of the palatine bones. They are slightly recurved, and can be distinctly seen only by aid of a lens; but anteriorly there are a few latter ones on both jaws, and two or three of the mandibular ones merit the name of canines. The knob of the vomer is conical and prominent, with a comparatively stout, compressed, conical central tooth and a ring of minute conical ones round its base. A transverse row of three pores on the occiput. Gill-plate extremely porous, and the snout and cheek also minutely porous. Lateral line a furrow extending from the temporal ridge to the tip of the tail, traversed through by a thin elevated cuticular seam. Dorsal and anal fins low and supported by unbranched tapering flexible rays, articulated towards their tips. Dorsal commencing rather before the second quarter of the total length and posterior to the beginning of the anal, which is close to the anus. The fins meet at the point of the tail, being connected there by membrane without the intervention of a caudal, since no rays spring from the extreme tip of the tail. Stomach cæcal, most of it below the pylorus, which is near the œsophagus. No pyloric cæca. Air-bladder long, extending far beyond the anus; in one specimen, with alternate dilatations and contractions, in another without contractions. Vertebræ 99, of which 19 have divergent processes that afford space for the viscera.

Total length	4·50 in.
Length of head to gill opening	0·63 ,,
Length to anus	0·59 ,,
,, dorsal	1·05 ,,

On the back and sides there are fine points, more crowded on the dorsal aspect, and the peritoneal sac is silvery with more scattered dots. Under the lateral line fifteen silvery spots extend and towards the gill-cover assume a golden lustre as in *F. acus*.

Seas of Australia and Timor (Richardson). At the Island of Guam (Quoy and Gaimard). At Martinique (Prichard), Bourbon, and Banda Neira (Bleeker). P. 16; D. 110; A. 160 (according to Bleeker).

12. Fierasfer boraborensis, *Kaup.*

Diagn. Length of the head comprised ten or eleven times in the total length of the fish.

Descr. One of the longest specimens, measuring 23 in., has on the vomer a round cluster of thick teeth. The distance from the tip of the snout to the anus is 1·22 in., and the pectoral fins are 0·35 in. long,

Borabora, where it was discovered by Lesson and Garnot.

13. Fierasfer parvipinnis, *Kaup*, fig. 2.

A disagreeable-looking fish, with a blunt head flat on the dorsal aspect, and swollen at the cheeks. Anal fin low, the dorsal very low and scarcely perceptible. Head forming a ninth part of the entire length. On the short forward projecting point of the vomer a terrace-like row of rising teeth which are not laterally compressed. The other dentiferous bones support two or three rows of nowise remarkable teeth. The species attains a length of 10·64 in., whereof the head constitutes 1·18 in., and the pectoral fins measure 0·28 in. Colour, a yellowish flesh tint with dark points.

Carteret Harbour, New Zealand, discovered by Quoy and Gaimard.

Genus 5. ENCHELIOPHIS, *Johannes Müller.*

No pectoral fins. Anus behind the gill-opening. Six branchiostegals.

14. Encheliophis vermicularis, *J. Müller.*

Encheliophis vermicularis, *Müller*, *Monatsbericht d. Ac. zu Berl.* 1842, p. 205.

Four inches long. Tail taper-pointed.

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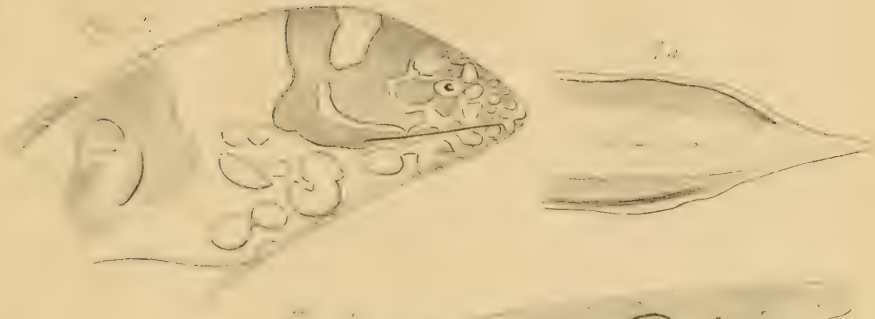

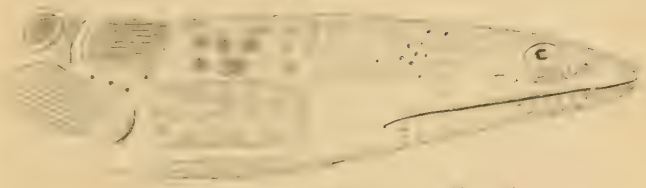

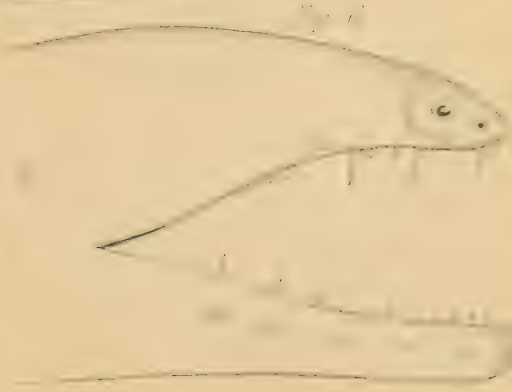

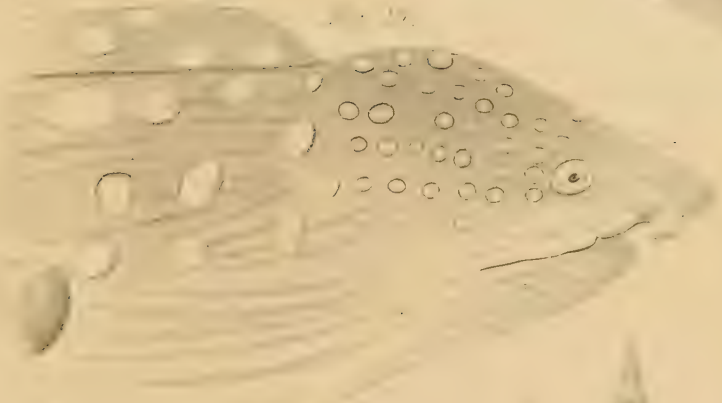

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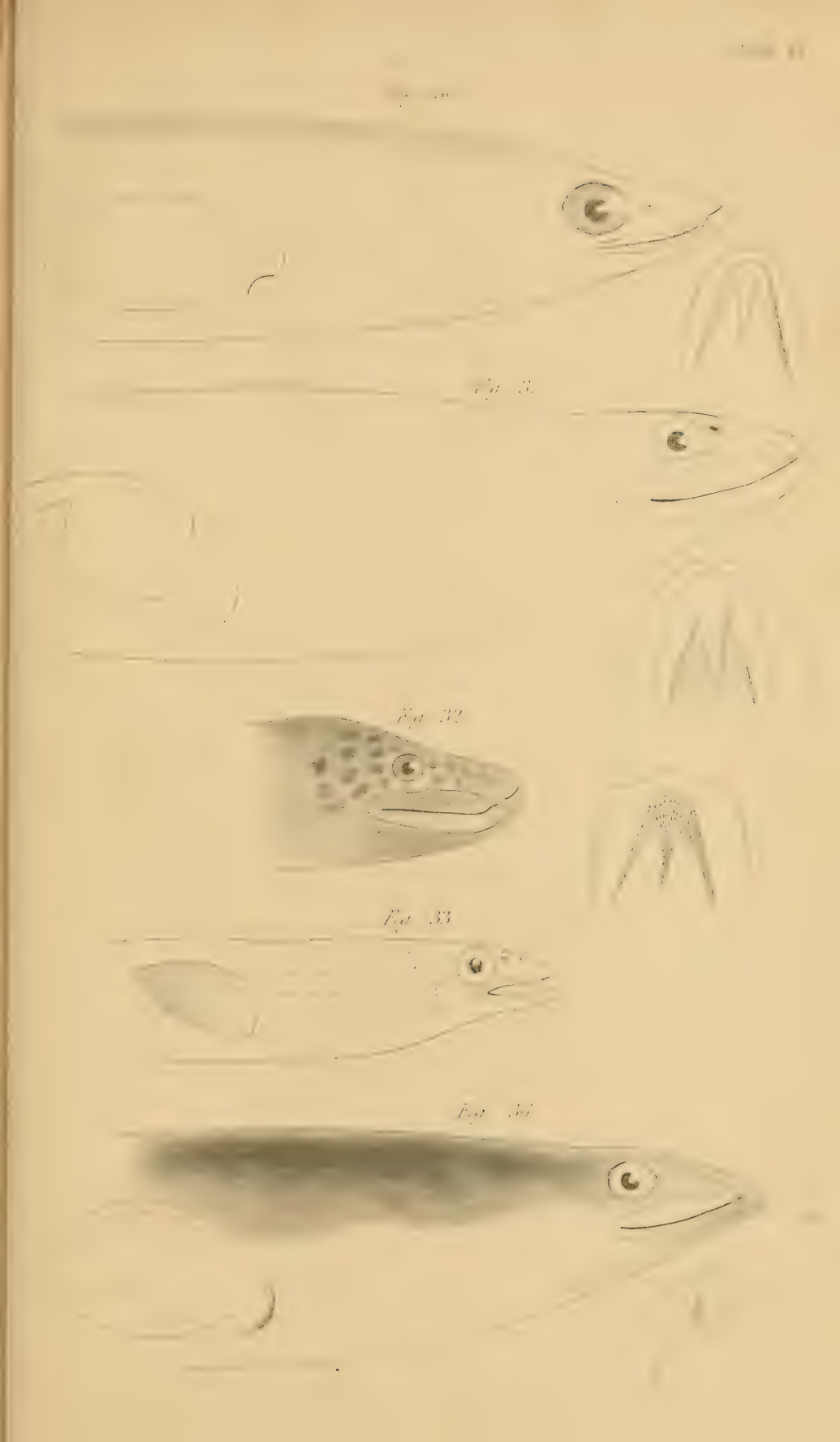

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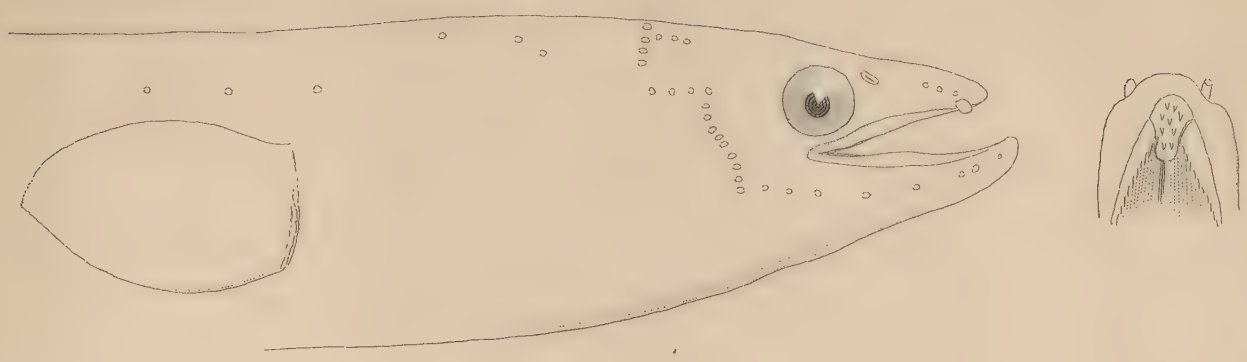

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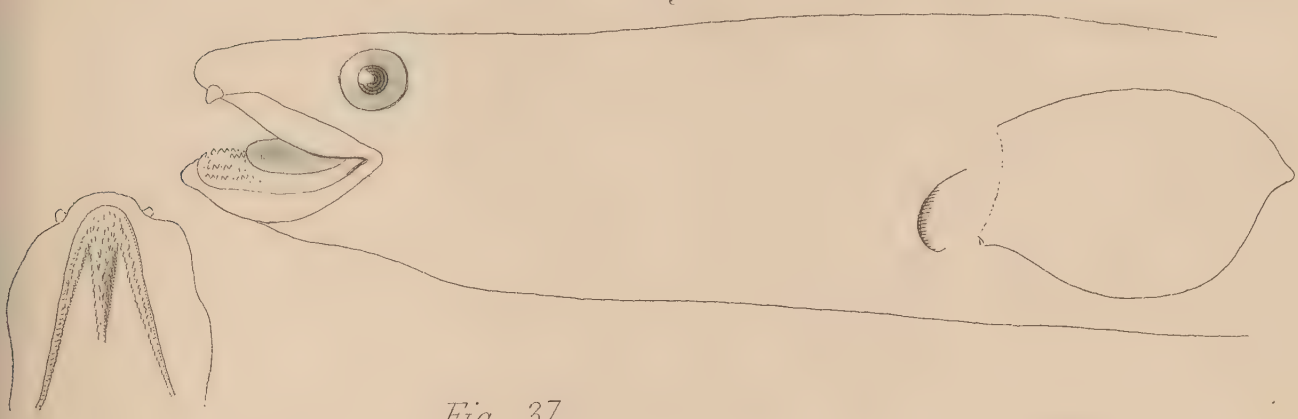

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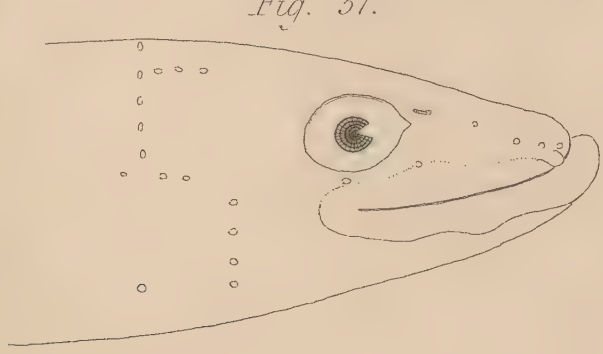

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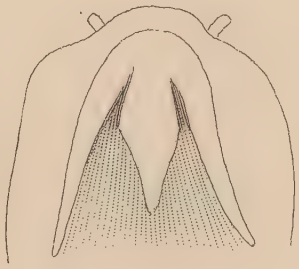

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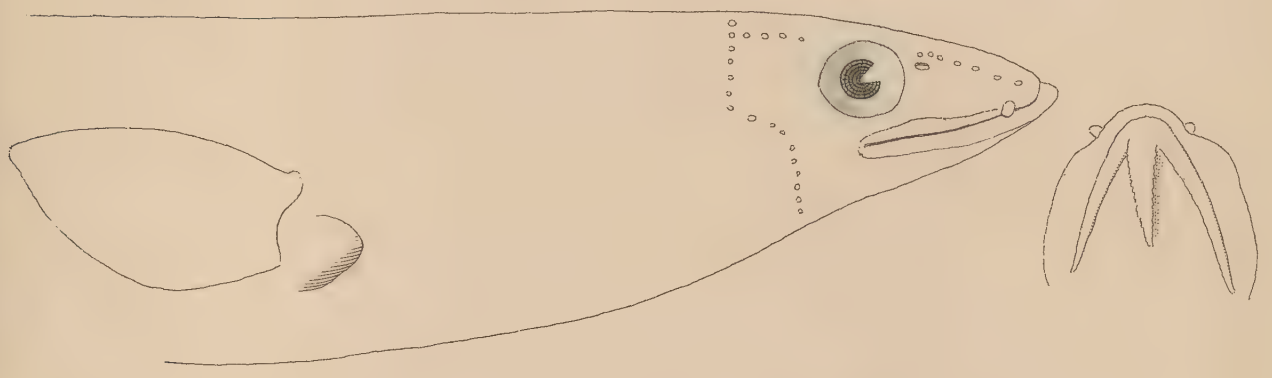

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Fig. 41

Fig. 42

Fig. 43

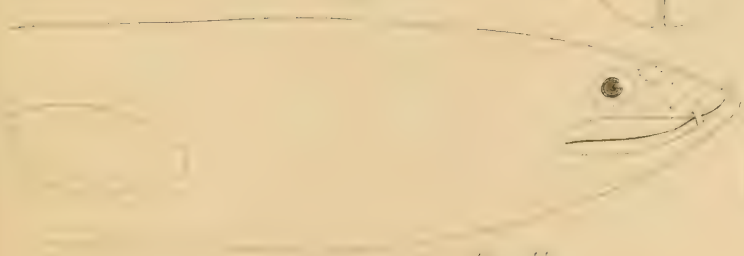

Fig. 44

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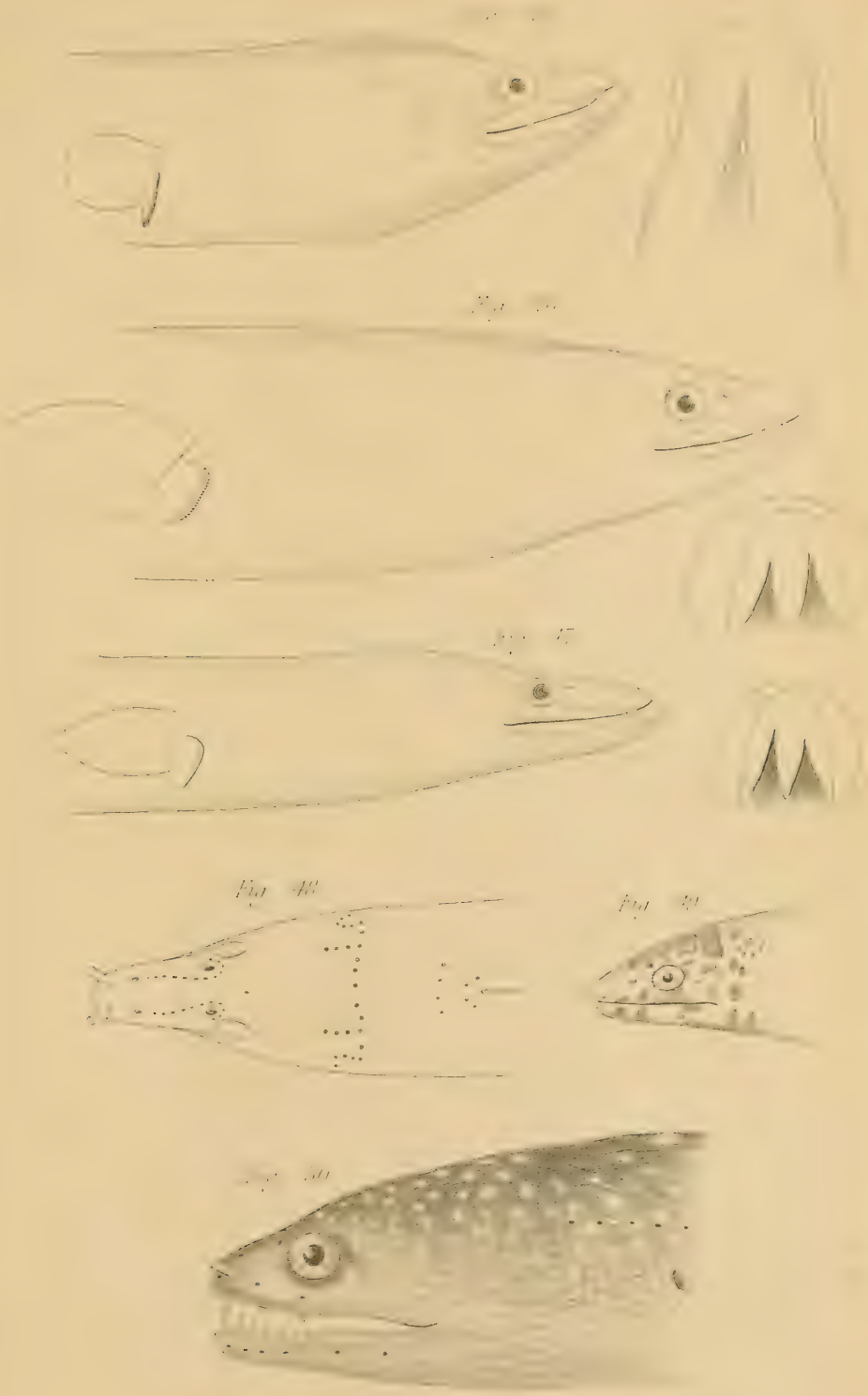

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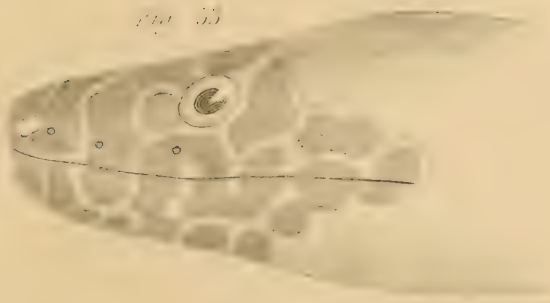

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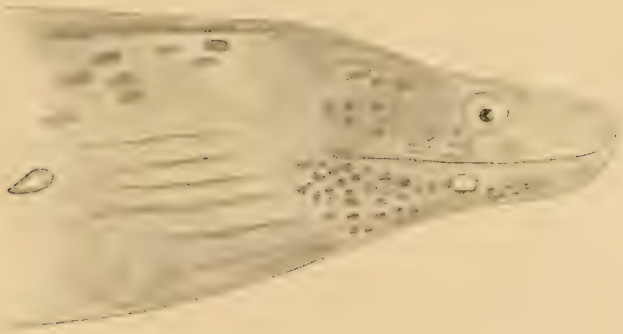

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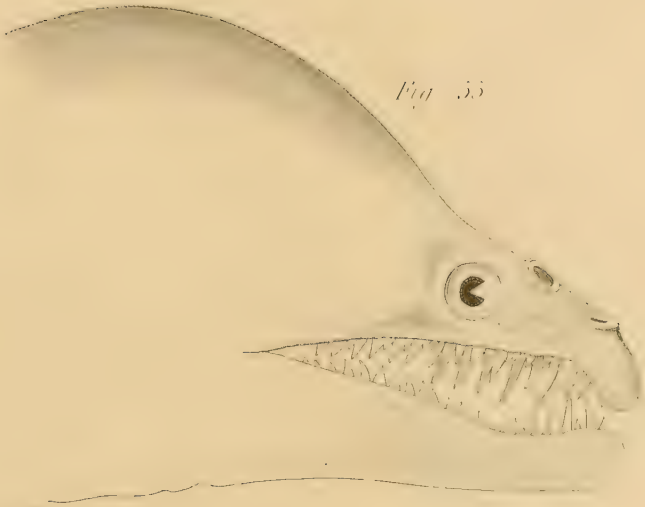

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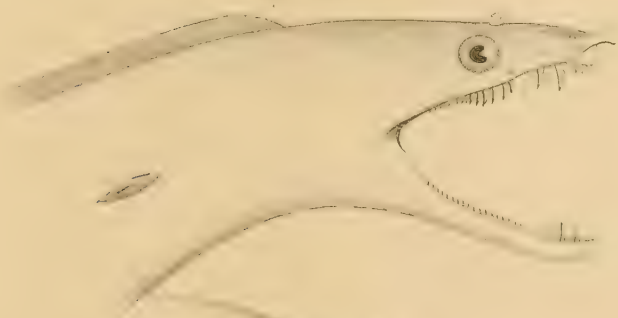

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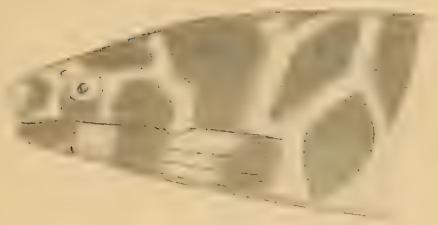

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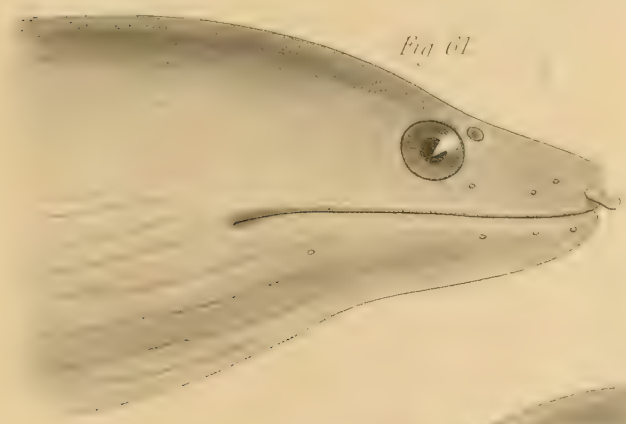

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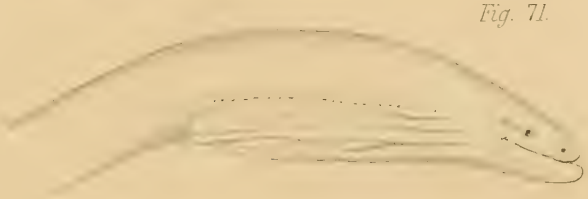

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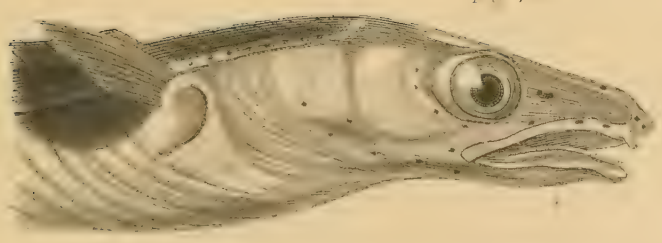

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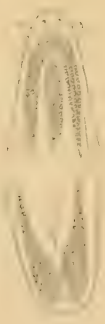

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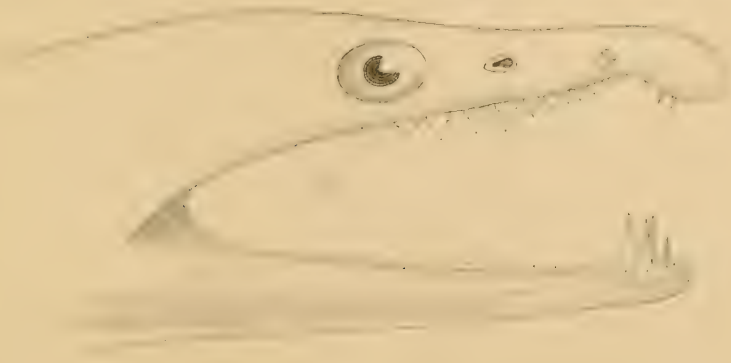

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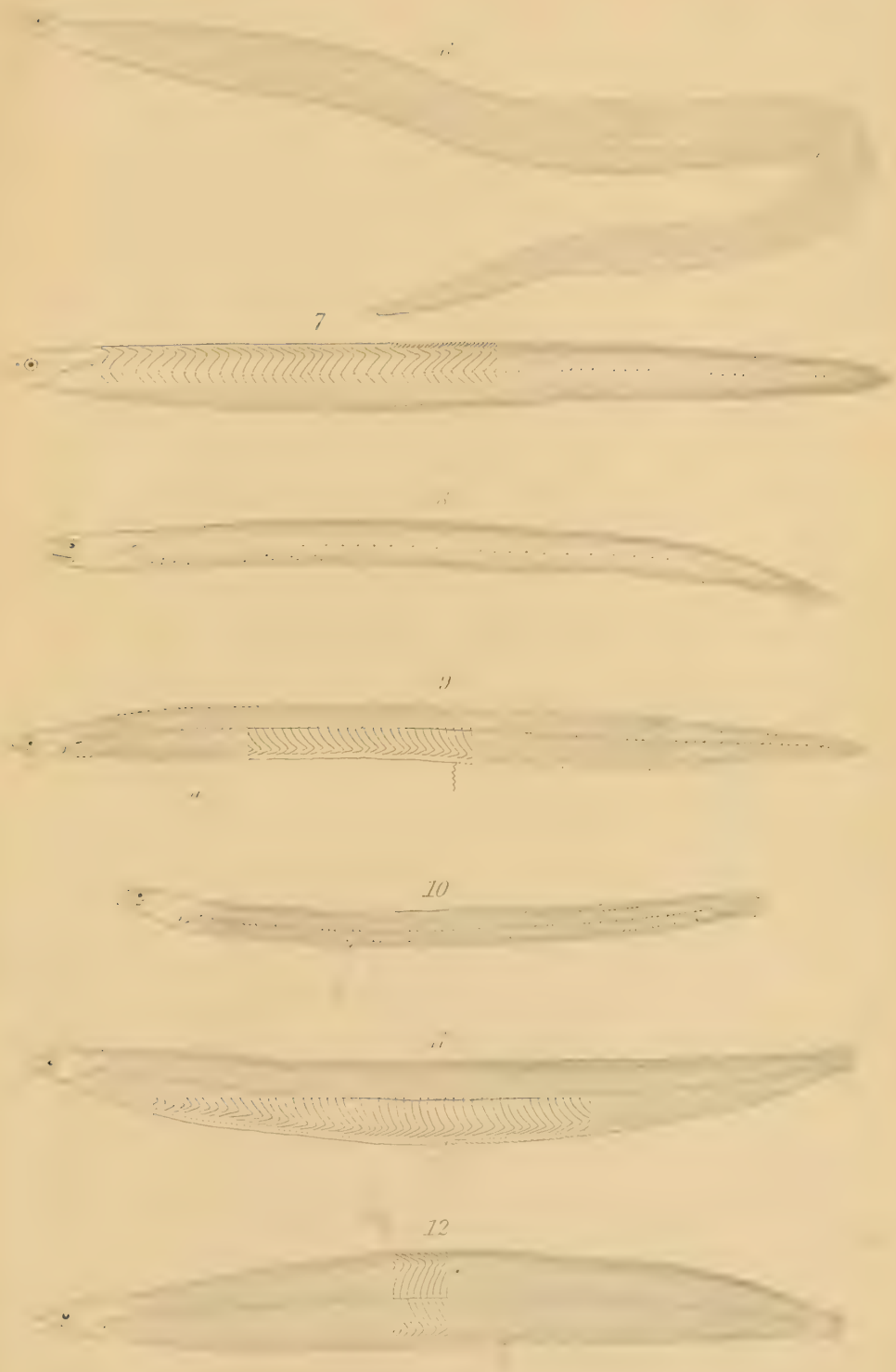

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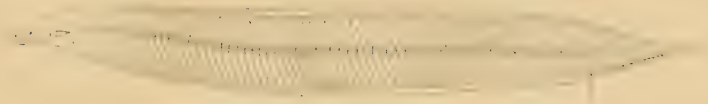

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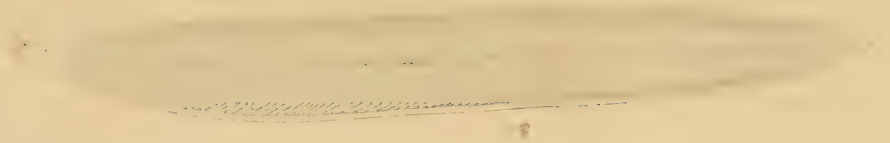

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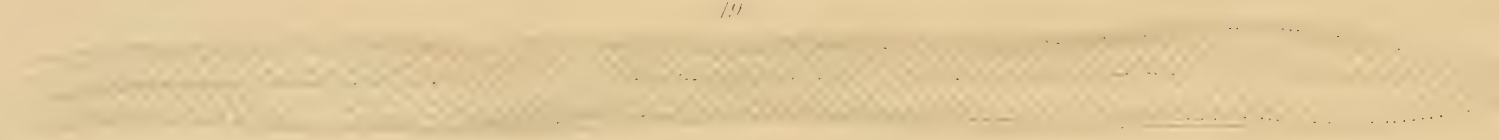

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